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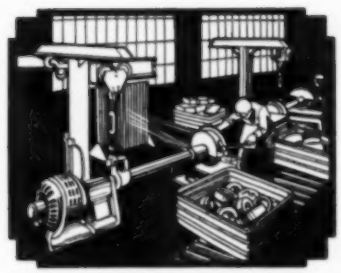

THE FOUNDRY

Established in 1892 by John A. Penton

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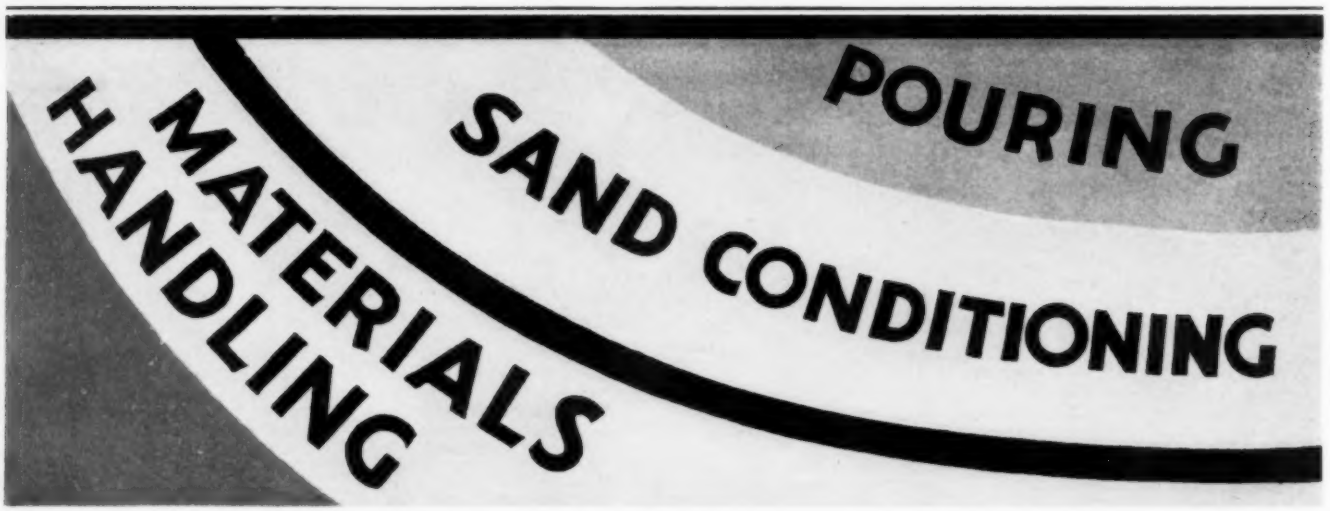

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THE FOUNDRY for October

No Repeal IN SIGHT

THOSE who expected NRA to lay the beautiful golden egg of price fixing in industry's basket were disappointed. The blue eagle isn't that kind of a bird. The antitrust laws haven't been given even a semipermanent waive and no repeal is promised in this prohibition sector, so far as the sale of manufactured commodities is concerned. List prices, with differentials, the reporting of open prices, agreements in codes not to sell below cost and some attempt at determining what such costs shall be constitute the only modifications of the rigid "thou shalt not" of the Sherman act and corralary legislation. The foundry industry accepts these gratefully. Coupled with the self discipline, a closer co-operation between competitors which NRA should stimulate, perhaps all may emerge from the depression era of senseless price cutting. Meantime the importance of proper costs is enhanced. No industrial establishment and most certainly no foundry can continue long in ignorance of costs.

Which Way TO PROFITS

UNDER code adherence labor costs will tend to level off, castings sales may be localized by undeflated freight charges and certain elements of competition are removed. Profits in the foundry business in the immediate future will be determined more largely by operating efficiency and salesmanship which goes beyond the wielding of the price chisel. Operating efficiency is a factor of good management and proper equipment. Throwing out obsolete machines and the procurement and use of the best that foundry equipment manufacturers can offer today is a major necessity. Moves to pump credit into use in promotion of capital goods sales provide the financial means not previously available for such new equipment. Then comes salesmanship, based upon quality and service. Present day metallurgy is a sound basis for broadening and increasing the use of castings.

Hats Off TO THE FLAG

WAR Memorial Hall in Indianapolis is nearing completion. It is dedicated to those who served and died in American service during the World war, an inspiration to patriotism and an emblem of patriotic ideals. According to a news report in a British commercial journal, the Birmingham Guild, Ltd. is executing a bronze, vitreous enameled cover for the shrine in this memorial. The news report offers the following terse comment:

"Difficulty was experienced in getting such work carried out in America, and the order was sent to Birmingham, despite the high tariff which will be imposed when the cover enters the States."

Patriotism is not circumscribed by tariff walls.

What's New in OCTOBER

MOLDING gears, long the final examination in foundry proficiency, explained in detail as practiced in a modern proficient plant (page 10). Code mills grinding and what of the grist (page 13). Malleable Founders' society offers a code for its industry embracing ample measures for self governing and administration (page 14). More on the why of cast steel quality as viewed by navy experts and friends (page 17). Collecting harmful dust from a swing frame grinder both feasible and practical (page 19). How lead affects bronze alloys (page 20). Manager views steel foundry operation under the NRA (page 25). No truce of knowledge hunt (page 26).

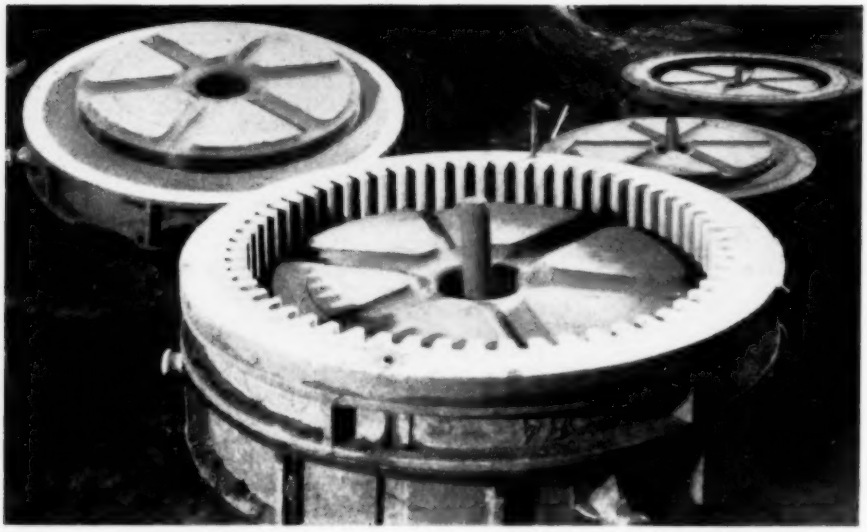


Fig. 1—The green sand mold for a spur gear is made in three parts, drag, cope and a ring containing the teeth—Illustrations courtesy Link-Belt Co.

Mold Gear Wheels on Machines

Some foundries use equipment having index plate and changeable gear trains

CAST iron gear wheels are molded according to a number of methods depending on many variable factors, including, size, shape, number on order, existing shop equipment, patterns and time of delivery. Single patterns are rolled over in drags and bedded in the floor. Patterns are mounted on molding machines and in some instances stripped through stripping plates. Segment patterns are attached to the ends of sweep arms and shifted around in a circle until the mold is complete.

In a comparatively small number of foundries, special machines have been installed for the production of gear wheel molds. Each machine is equipped with an index plate and changeable gear trains to accommodate gear molds between certain definite size limits. For example a typical installation includes one machine capable of molding gear wheels between 3 and 7 feet in diameter. A second machine can handle molds for wheels between 8 and 15 feet and a third machine covers a range between 16 and 25 feet.

The only pattern equipment required for the production of a mold on one of these machines is the tooth block which governs the size, shape and style of the tooth, and possibly one or two sweeps to form the faces on the cope and drag. Usually, also, a corebox is required to form the arms and hub for one type of wheel, or, a partial or total web for another style.

Any molder who has employed the usual pattern segment with one, two or a greater number of teeth attached to the end of the usual sweep arm, knows how extremely slow and annoying

Fig. 2—That part of the mold containing the arms is formed in green sand core segments

is the process of setting and resetting the segment on the working circle so that the last tooth will coincide with the first after the segment has been tried all around the circle.

The usual practice is to set the segment as accurately as possible over a prepared sand bed in the floor or in a drag and then shake flour or any other powder around the base of the teeth. An accurate imprint is secured in this manner. The segment then is lifted a short distance, swung around and lowered again on the sand bed in such a manner that the last tooth on the left end of the segment coincides with the imprint of the last tooth on the right end of the former impression. The foregoing is based on the assumption that the sweep arm is rotated in the usual manner from left to right or *with the sun* as shown in Fig. 3.

Even with the greatest care the operator usually will have to complete the circle two or three times and make minor adjustments in the sweep before the imprint on the sand bed is an accurate representation of the teeth in the anticipated wheel. It is readily apparent that a slight variation in the setting of the tooth block on each occasion will roll into a serious total. An error at the beginning of 0.01-inch will amount to 1-inch at the last setting of the segment on a 100-tooth wheel.

Guard Against Error in Spacing

A slight error in the radial length of the sweep arm will affect the proper spacing of the teeth. Even where the layout and equipment are accurate to the minutest detail, the molder still can go astray by *crowding* the segment unduly in either direction, during each ramming operation.

Molds shown in the accompanying illustrations furnished through the courtesy of the Link-Belt Co., Chicago, were made on a gear molding machine which eliminates practically all the variable factors and hazards incident to the production of this type of casting. Results are as accurate as those secured in the machine shop. Each tooth is molded in place with mathematical and mechanical accuracy. Nothing is left to chance, to the skill, or lack of skill in the operator. The machine may be set for a gear of any given number of teeth, on a given circle. All the molder has to do is to ram these teeth one after the other in succession until the circle is complete. He can proceed in full assurance that the last tooth will be as accurately placed as the first, that the circumferential and pitch diameters are as specified and that the shrinkage will be as anticipated. Moreover, the wheel will be truly circular, a feature which does not always characterize gear wheels made under different conditions.

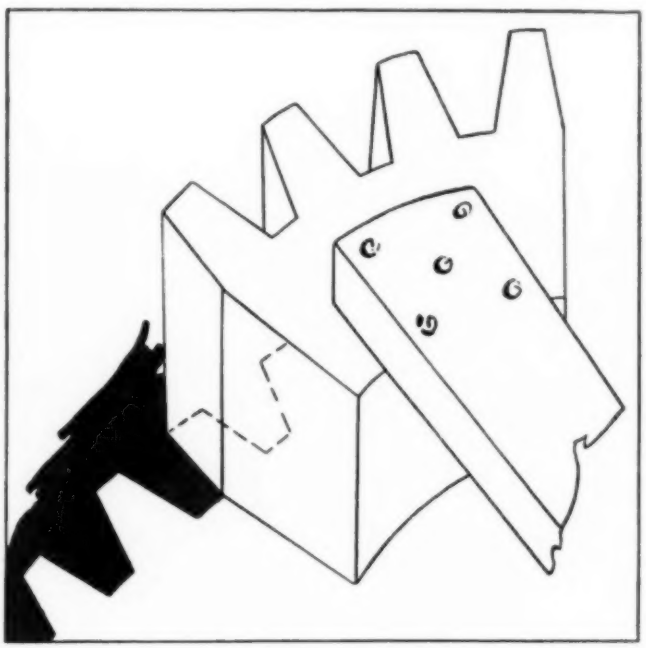


Fig. 3—The first tooth on the segment rests on the impression of the last tooth in the preceding group

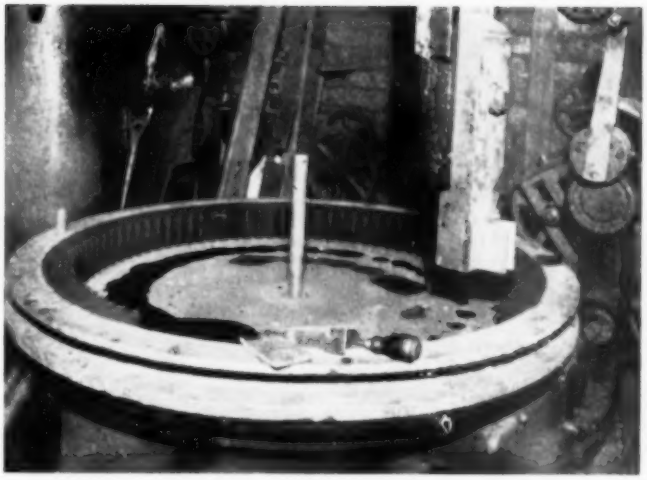


Fig. 4—Sand teeth are formed in a brass tooth block attached to an indexing mechanism which spaces the teeth accurately around the circle

One reason for this true circle is that machine molded gears are made in substantial iron or steel flasks, machined on the joints to secure close and accurate joints between the various sections of the mold. The drag is not rolled over, therefore there is no sag to the sand either on the bottom or on the high side of the flask. Many otherwise excellently constructed molds yield distorted castings on account of weak flasks.

Flask Springs Out of Shape

If the flask is not strong enough, one side, the side to which the crane is attached will spring out of shape while the flask is being rolled over. In extreme cases the side will retain a permanent set, showing a well defined opening between the sand and the side of the flask. In other cases, although the distortion may not be apparent, the body of sand may not be supported solidly against the flask wall, and later, may yield enough under pressure of the molten metal to produce a casting not truly round in shape.

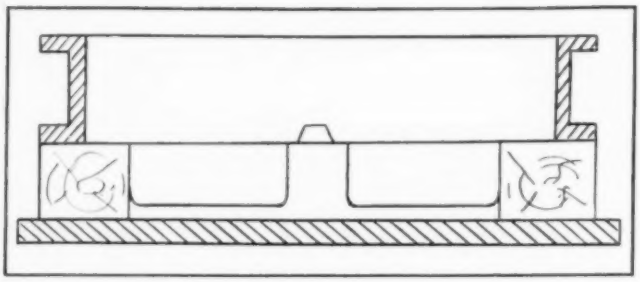


Fig. 5—Cope and drag are formed on a symmetrical half pattern where the tooth ring is formed on the gear machine

If the bottom board is not strong enough, or if it is not supported properly on the floor, the body of sand in the drag will sag, resulting in a set of strained arms and a fin, which in extreme cases, may form a solid web between the arms. Strong iron or steel flasks and bottom plates employed on gear molding machines, automatically remove these potential sources of trouble.

To be strictly accurate, the term gear molding machine is a little too comprehensive. Properly speaking it is a tool or instrument for locating the teeth in the mold. It does not fill the flask with sand or ram the sand in place. In many instances the drag—with the exception of the teeth—and the cope are rammed by hand or on a jolt machine. In other instances the tooth ring only as shown in Fig. 1 is formed on the machine and then, as a cheek, is placed on a prepared drag. Under other conditions the table of the machine and the central spindle are utilized to sweep the necessary contour on the face of either cope or drag. Typical exemplification of each of these variations is shown in the accompanying illustrations.

Use Coal Dust Facing on Teeth

Where these wheels are to be cast in green sand, the facing sand for the teeth is passed through a No. 8 riddle before it is used. This facing, made up of approximately half and half new and old sand, contains from 10 to 16 per cent coal dust depending on the thickness of metal in the wheel. The usual amount for wheels with an average metal section of 1-inch is 12.5 per cent or 1 to 8, one part coal dust to 8 parts sand. A thin film of plumbago or carbon blacking is applied to the surface of the sand teeth in the mold. One man shakes a blacking bag in front of the teeth while a second man armed with a hand bellows blows the blacking against the sand. A modification of the blow-can recently placed on the market enables one man to apply this form of coating.

In recent years the development and introduction of blow torches of various types has encouraged the practice of skin drying the teeth on gear wheel molds. The practice is to be commended since it insures a clean, smooth surface on the teeth of the casting and incidently reduces the labor cost in the cleaning department.

Where skin drying is practiced the No. 8 riddle may be discarded and a coarser grade of sand rammed in the teeth. The thick coat of wet blacking will present the necessary smooth face to the metal. A fairly satisfactory job may be done by spraying the wet blacking on the teeth, but on large wheels it usually is applied with a long, slender swab. The only objection to the swab is that it can be entrusted only to a man skilled in its use. A high degree of manual skill and dexterity is required to avoid knocking the tops from the sand teeth and to prevent the formation of pools of blacking in the lower ends of the teeth.

Brass Tooth Blocks for Long Orders

The cheek part for a 6-foot spur gear partly completed is shown in Fig. 4. In this instance a cheek flask the same height as the face of the teeth was mounted on the table of the gear molding machine. This wheel is a repeater, therefore a brass tooth block pattern was employed instead of the usual wood pattern employed on single or small order jobs. The tooth block was attached to the upright arm of the machine and then the index plate and other related mechanism was set to locate a definite number of teeth on a given circle. The actual figures are not available, but that is a detail of no importance in a description of the application of this type machine in (*Please turn to page* 42)

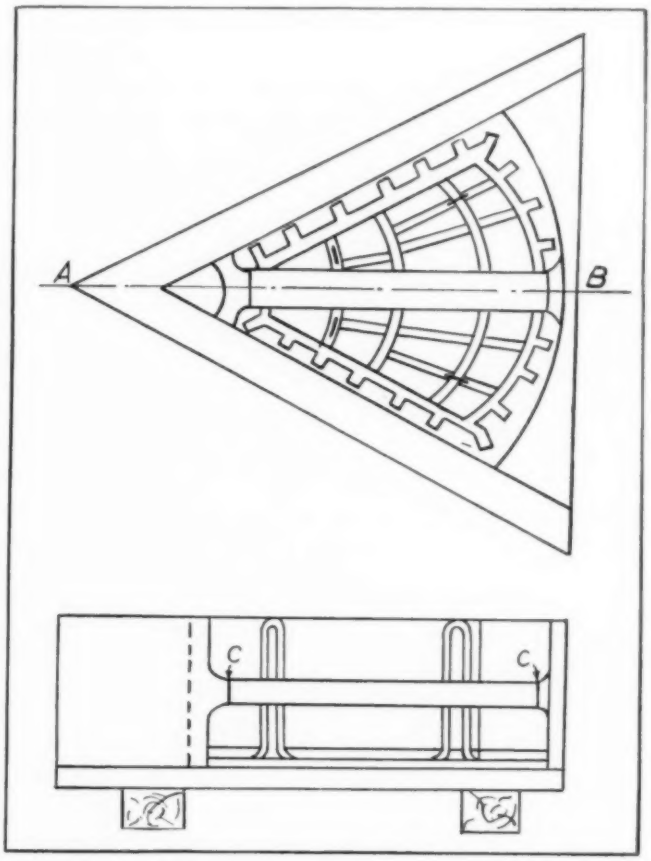


Fig. 6—Upper is a plan and lower is a sectional view of the corebox and equipment for forming the arms and inside of the gear wheel

Study Effect of Codes

Industry awaiting Washington approval takes inventory of increasing costs and duties

WITH four general foundry codes filed in Washington prior to Sept. 1 and covering the steel, malleable, nonferrous and gray iron divisions of the industry, foundries throughout the country awaited the kickoff under the new rules. Many shops were operating under the President's employment agreement, they displayed the blue eagle and put into effect the provisions which under the prevailing limited rate of operation meant little or no shortening of actual hours of employment. Meantime, substitution of the respective industry code provisions for the PRA labor and wage rules was permitted each of the three associations on whose codes hearings had not been held. The Malleable Founders' society, Nonferrous Association for Industrial Recovery and the Gray Iron Founders society members each were accorded the privilege of this substitution for firms participating in the codes presented by the three organizations mentioned.

Steel Founders Have Hearing

The hearing on the Steel Founders' society code was held Sept. 7, but minor revisions in phraseology it was announced delayed final approval until after Oct. 1. The public hearing date on the malleable code was set for Oct. 2 and for the nonferrous Oct. 11, both assigned to Deputy Administrator H. O. King. The malleable code as presented at the public hearing appears elsewhere in this issue. Many and varied are the reactions encountered in the industry wherever the NRA is discussed. Those making castings destined for the heavy industries for machine tools and equipment depending upon capital outlay report the devastating effect of uncertainty. They blame the recovery act for deferred buying and cite cancellations of customers orders that have destroyed hope of early castings purchases. They believe that except for the intervention of this legislation, the upturn in early summer would have followed through and been intensified in the fall.

Those foundries whose products find their way into direct consumption, such as through automobile manufacture, are more active. The rate of operation in such shops is higher. Miscellaneous jobbing work was much more active in August and continued through the major portion of September, but the activity was not general in any one branch, nor in all plants making similar castings. Among even the busiest of these foundries the effect of NRA is variously analyzed. Few assign credit directly to the national movement beyond an appreciation of the trend toward higher castings prices. Difficulties are foreseen in small communities where limited available labor has already been encountered under shortened hours and spread shifts.

Price Advance Is Apparent

The direct effect of price advance is becoming apparent in the foundry industry. The average advance in cost due to labor and supervision in gray iron foundries is said to be in excess of $10 a ton. While the advance in pig iron, scrap and coke has not been extreme, the September melt cost is said to be about $3.50 a ton over that found in June. Other miscellaneous costs bring the total advance in gray iron castings costs to about $15 a ton since early summer.

A slightly greater advance in costs is noted in malleable foundries with practically the same differentials in labor and metal tapped. In both instances, the fuel item is likely to be still more affected when the coal code is in force and the subsequent rise in coal and coke prices become effective.

In steel foundries the direct application of code conditions probably will bring forth some interesting comparisons. Spread work has not proved efficient in this branch of the industry when voluntarily applied, during the past year. Doubtless it will prove uneconomical when all steel foundries encounter the practical operating difficulties of the code hour provisions, unless operations are markedly improved.

The lesson is clear to read. Higher prices to meet advancing costs. The trade associations which have been charged with the responsibility and expense of setting up and negotiating codes have had their difficulties. Individual foundrymen, who have been designated on code committees have submerged (*Please turn to page* 65)

Malleable Founders' Society Code

Two districts provide differential for minimum rates of pay for common labor

MALLEABLE Founders' society on Sept. 19, presented a code of fair competition of the malleable iron industry to the National Recovery administration at Washington. The formal hearing on this code, which has been agreed to by 90 per cent of the producing capacity of the industry, was held Oct. 2, 1933 and is reported on page 32 of this issue. The code as submitted is as follows:

Article I—Purpose

SEC. 1. The code is adopted pursuant to Title I of the National Industrial Recovery act.

SEC. 2. The purpose of the code is to effectuate the policy of Title I of the National Industrial Recovery act insofar as it is applicable to the industry.

Article II—Definitions

Wherever used in this code or in any schedule apertaining hereto the terms hereinafter in this article defined shall, unless the context shall otherwise clearly indicate, have the respective meanings hereinafer in this article set forth.

SEC. 1. The term "the United States" means and includes all of the contiguous territory of the United States of America on the North American continent.

SEC. 2. The term "the President" means the President of the United States of America.

SEC. 3. The term "the Industry" means and includes the business of producing, in the United States, malleable-iron castings regardless of whether such castings are sold or used for the purposes of the producer, or used for the purposes of an affiliate, subsidiary, or parent company of the producer.

SEC. 4. The term "member of the Industry" means and includes, but without limitation, any person, firm, association, corporation, or other entity operating a plant or plants in the United States for the production of malleable-iron castings.

SEC. 5. The term "the Code" means and includes this code and all schedules annexed hereto as originally approved by the President and amendments hereof made as hereinafter in Article XI provided.

SEC. 6. The term "Society" means the Malleable Founders' society.

SEC. 7. The term "Board of Directors" means the board of directors of the society.

SEC. 8. The term "member of the Society" means any member of the industry who has assented to the code by signing and delivering to the secretary a letter substantially in the form set forth in schedule A. Nothing in such schedule A shall be construed to restrict the right of any member of the industry to express his adherence to or participation in the code in any other appropriate manner.

SEC. 9. The term "the effective date of the Code" means the tenth day after the date on which the code shall have been approved by the President pursuant to the National Industrial Recovery act.

Article III—Hours of Labor, Rates of Pay, and Other Conditions of Employment

SEC. 1. Pursuant to subsection (a) of section 7 of the National Industrial Recovery act and so long as the code shall be in effect:

(a) Employes shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purposes of collective bargaining or other mutual aid or protection;

(b) No employe and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing; and

(c) Employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment approved or prescribed by the President.

SEC. 2 (a) Except in the case of executives, those employed in directing or supervisory capacities and in technical or other highly skilled work, and members of their respective staffs, individually receiving pay at the rate of $35.00 or more per week, and outside salesmen, watchmen, and repair work employes to the extent required by an emergency, no member of the industry shall cause or permit any employe, including clerical and office employes, to work more than 40 hours per week, unless in peak periods of production when the hours per week of factory employes for a period not to exceed 6 weeks in any 6 months shall not exceed 48, nor more than 6 days in any one week; provided that whenever sufficient employes qualified for any type of work are not available to any member of the industry in a particular locality, such hours of labor may, with the approval of the Administrator, be increased to the extent required by such member of the industry to perform such work.

(b) After the date of the employment by any member of the industry of any employe, such member shall not knowingly permit such employe who shall also have performed work for one or more other employers, to work for such member such number of hours as would result in a violation of the code had all such work been performed for such member.

SEC. 3. No member of the industry shall employ in the industry any person under 16 years of age, and no one under 18 years of age shall be employed in hazardous work.

SEC. 4. It is recognized that geographical wage differentials have existed in the industry. For the purpose of providing for geographical wage differentials, the United States is divided into two districts. District No. 1 comprises all that part of the United States except the states of Tennessee, Mississippi, North Carolina, South Carolina, Georgia, Alabama, and Florida. District No. 2 comprises all of the above-named states.

SEC. 5. (a) The minimum rates of pay per hour which shall be paid by members of the industry for common male labor not including learners, minors between 16 and 20 years of age, superannuated and maimed employes) in its employ in the industry in District No. 1 shall not be less than 40 cents per hour, and in District No. 2 shall not be less than 30 cents per hour, unless the hourly rates paid for the same class of labor on July 15, 1929, were less than the rates above specified, in which latter case the minimum rates of pay shall not be less than the hourly rates on July 15, 1929, and in no event less than 30 cents per hour in District No. 1, or less than 25 cents per hour in District No. 2.

(b) The minimum rates of pay per hour which shall be paid by members of the industry for female labor, learners, minors between 16 and 20 years of age, superannuated, and maimed employes shall not be less than 75 per cent of the minimum rates of pay as hereinbefore specified or determined for male labor, and in no event less than 30 cents per hour in District No. 1 or less than 25 cents per hour in District No. 2. Where women perform in all respects the same kind and amount of work as men, they shall receive the same wages.

(c) The number of learners, superannuated, and maimed employes employed by any member of the industry shall not

exceed 5 per cent of the total number of its employes.

(d) Equitable adjustment in all pay schedules of plant employes above the minimums, shall be made on or before the effective date of the code by employers who have not theretofore made such adjustments and the first monthly reports of wages required to be filed under the code shall contain all wage increases made since June 16, 1933.

(e) In the case of employes performing work for which they are paid for piecework performed, the minimum rate of pay which each member of the industry shall pay for such work shall produce at the average rate of performance the minimum rates of pay per hour provided in the code.

(f) On and after the effective date of the code, the minimum wage that shall be paid by any employer to clerical and office employes shall be at the rate of $15.00 per week; provided, however, that office boys or girls may be paid not less than 80 per cent of such minimum wage.

SEC. 6. Within each state members of the industry shall comply with any laws of such state imposing more stringent requirements regulating the age of employes, wages, hours of work or health, fire or general working conditions, than under the code.

Article IV—New Capacity

SEC. 1. During the period of the emergency and except with the approval of the Administrator, no malleable-iron foundry capacity shall be increased or new foundry constructed; provided, however, that nothing herein contained shall be construed to forbid substitution of one melting process for another, if such substitution shall not result in substantially increased capacity for production.

Article V—Administration of the Code

SEC. 1. The administration of the code shall be under the direction of the board of directors.

SEC. 2. The expense of administering the code shall be equitably apportioned among all members of the industry in the following manner: The board of directors shall from time to time make such assessments upon account of such expenses against members of the industry as it shall deem proper, and shall apportion such assessments upon the basis of the average annual shipments in net tons of each member of the industry, including all malleable castings produced by any member of the industry for its own use or that of any affiliated, parent or subsidiary company, for the 3 preceding calendar years. Such assessments shall be payable as such board shall specify. In the event any member of the industry shall not have been in operation during all of the 3 preceding calendar years such assessments shall be based on such period as the member was in operation.

SEC. 3. The board of directors may, from time to time, appoint such committees as it shall deem necessary or proper, to effectuate the purpose of the code, and it may delegate to any such committee generally or in particular instances such of the powers and duties of the board of directors under the code as such board shall deem necessary or proper to effectuate such purpose. Any member of such committee may be a member of the board of directors or an officer, director, or representative of a member of the society.

SEC. 4. No inequitable restrictions shall be imposed upon membership in the society or its successor and no material changes shall be made in the constitution and/or by-laws without the approval of the administrator.

Article VI—Selling Below Cost

Subject to the approval of the Administrator, the board of directors shall prescribe a cost-accounting system which conforms to the principles of and is at least as detailed and complete as the uniform and standard method of cost finding set forth in the *Manual of Accounting* issued by the society with such modifications therein as may be promulgated from time to time by the board. The board of directors shall in accordance with such cost-accounting system and with the approval of the Administrator determine periodically fair and reasonable costs of production in the industry for different types of malleable iron castings.

Each member of the industry shall install and use such cost-accounting system as prescribed and, subject to the approval of the Administrator, shall be furnished by the board of directors with the periodical tabulations of costs and cost differentials arrived at in accordance with such cost-accounting procedure. Any member of the industry who shall fail to install and use the cost-accounting system so prescribed or who shall sell malleable iron castings below the fair and reasonable costs of production as shown by the aforesaid tabulations shall be guilty of a violation of the code.

Article VII—Unfair Practices

For all purposes of the code, the acts described in schedule B, presented following this code, shall constitute unfair practices. Such unfair practices shall be deemed to be unfair methods of competition in commerce within the meaning of the federal trade commission act as amended, and the using or employing of any of them shall be deemed to be a violation of the code and any member of the industry who shall directly or indirectly, through any officer, employe, agent, or representative, use or employ any of such unfair practices, shall be guilty of a violation of the code.

Article VIII—Reports and Statistics

SEC. 1. The board of directors shall have power to require each member of the industry to furnish to the secretary of the society such information concerning the production, shipments, sales and past sale prices of such member, and the hours of labor, rates of pay and other conditions of employment at the plant or plants of such member, and such other information as the board of directors shall deem necessary or proper to effectuate the purpose of the policy of Title I of the National Industrial Recovery act, and to enable the board of directors to determine costs of production as set forth in Article VI. The board of directors may require that any such information be furnished periodically at such times as it shall specify and may require that any or all information furnished be sworn to or otherwise verified or authenticated, as it shall prescribe. Failure of any member of the industry promptly to furnish to the secretary of the society information required by the board of directors and substantially in the form prescribed by it, shall constitute a violation of the code. The board of directors shall not have power to require any information regarding trade secrets or the names of the customers of any member of the industry.

SEC. 2. Any or all information furnished to the secretary of the society by any member of the industry shall be subject to checking for the purpose of verification by an examination of the pertinent books and accounts and records of such member by any accountant or accountants or other person or persons designated by the board of directors and shall be so checked for such purpose, if the board of directors shall require it. The cost of each such examination shall be treated as an expense of administering the code; provided, however, that, if upon such examination any such information shall be shown to have been incorrect in any material respect, such cost shall be paid by the member of the industry which furnished such information.

SEC. 3. To the extent that such information is of a confidential character and that the publication thereof is not essential in order to effectuate the policy of Title I of the National Industrial Recovery act, such information shall be treated as strictly confidential and no publication thereof shall be made in any other manner than in combination with similar information furnished by other members of the industry, in which case the publication shall be made only in such manner as will avoid the disclosing separately of such confidential information.

SEC. 4. In addition to information required to be submitted to the board of directors, there shall be furnished to government agencies such statistical information as the Administrator may deem necessary for the purposes decided in Section 3 (a) of the National Industrial Recovery act.

Article IX—Penalties and Damages

SEC. 1. Recognizing that the violation by any member of the society of any provision of Article VI of the code will disrupt the normal course of fair competition in the industry and cause serious damage to other members and that it will be impossible fairly to assess the amount of such damage to any member, it is hereby agreed by and among all members of the society that each member which shall violate any such provision shall pay the treasurer as an individual and not as treasurer of the society, in trust, as and for liquidated damages, the sum of $20 per ton of any product sold by such member in violation of any such provision.

SEC. 2. Except in cases where liquidated damages are fixed in the code, and in cases which shall give rise to actions in tort in favor of one or more members of the society for damages suffered by it or them, the board of directors shall have power, from time to time, to establish the amount of liquidated damages payable by any member of the society upon the commission by such member of any act constituting an unfair practice under the code and a list of the amounts so fixed shall, from time to time, be filed with the secretary. Upon the commission by any member of the society of any act constituting an unfair practice under the code and for which liquidated damages are fixed as heretofore provided, such member shall become liable to pay to the treasurer as an individual and not as treasurer of the society, in trust, liquidated damages in accordance with the schedules filed with the secretary; provided, however, that the secretary

(*Please turn to page* 46)

Beautiful new municipal convention hall at Philadelphia where the 1934 convention and exhibit will be held

A. F. A. Selects Philadelphia

International Foundry Congress will augment 1934 convention and exhibition activities

PHILADELPHIA has been awarded the 1934 convention and exhibition of the American Foundrymen's association. Recent action of the board of directors, as announced by C. E. Hoyt, executive secretary, resulted in the selection of the beautiful new municipal convention hall of that important Eastern foundry center for all activities connected with the technical meetings of the association and a large scale exhibition of foundry equipment and supplies. The convention will be held Oct. 22 to 26.

Co-operation of European foundry organizations in the Philadelphia meeting already has been assured. The International committee of foundry technical associations recently awarded the American Foundrymen's association the honor of holding the Fifth International Foundry congress and exposition in the United States in 1934, and this will be held in connection with the annual A.F.A. convention.

The overseas countries whose foundry associations are members of the Committee on International congresses include Great Britain, Spain, Belgium, Czechoslovakia, Italy, France, Germany and Holland. Representatives of these countries will visit the United States to participate in the deliberations of the convention. The first International Foundry congress was held in Paris in 1923, the second in Detroit in 1926, the third in London in 1929 and the fourth in Paris in 1932. The international character of these congresses may be better understood when it is realized that 16 foreign countries were represented in the attendance at the exceedingly successful congress held in Detroit in the fall of 1926.

The Philadelphia convention hall, one of the finest in the country, not only has adequate space for the exposition of foundry equipment and supplies, but also includes broad facilities in the way of meeting rooms for technical sessions and other meetings which will feature the convention.

The directors of the A.F.A. also have decided that the 1935 convention of the association will be held without an exhibit and will be simliar in character to the exceptionally successful meeting held at the Edgewater Beach hotel in Chicago in 1927, following the International Foundry Congress in Detroit.

Cast Steel in Europe and America

Further comments on article by naval officer which discusses steel foundry practice abroad

By PAT DWYER

IN DISCUSSING Captain Louis Shane's paper on European steel foundry practice which appeared in the February 1933 issue of the *Journal of the American Society of Naval Engineers* Maj. R. A. Bull has pointed to the fact that approximately 175 out of the total of 275 steel casting foundries in the United States fall under the commercial classification in which the navy may be interested as a source of supply. Major Bull's discussion appeared in the May 1933 issue of that publication. Discussion of Captain Shane's paper was presented in THE FOUNDRY for August.

Manifestly great differences exist in equipment, personnel and in the degree of financial stability. The product ranges from plain carbon steel to a variety of alloy steels running as high as 30 per month. The capacity of the plants also varies to a wide extent. It would be strange indeed if these and many other factors did not result in a wide range of prices for castings. Generally speaking, objects that are made cheaply are sold cheaply. Costs are higher where all necessary safeguards are provided for the manufacture of a dependable product. Continued manufacture can be expected only where the manufacturer realizes a satisfactory return on his investment. The navy never reasonably can expect to obtain thoroughly satisfactory castings until some procedure is set up permitting discriminatory consideration of proposals in respects other than price alone. Many large transportation and industrial corporations maintain approved lists of suppliers to which potentially acceptable bids are restricted.

Welding Improves Surface Appearance

Basing his opinion on experience gained in 14 steel foundries over a period of more than 30 years Major Bull claims that welding in the competently managed steel foundry has been confined principally to improving the surface appearance and in a manner that did not affect the proper functioning of the casting. Insistence of the purchaser on a very smooth skin, despite the inherent difficulties of production, occasionally may have prompted wholesale welding of surface blemishes to a degree that weakened the casting. Sometimes it would seem that the effect of surface blemishes on the performance of a casting has been subordinated injudiciously to the aesthetic element of presentability.

He was not surprised to learn that Captain Shane found sand testing and control equipment in European foundries was of American origin. This was to be expected. Systematic molding sand research began in 1921, several years before co-operative work of that kind was undertaken abroad. As head of the joint committee on molding sand research for the first 3 years Major Bull was associated with 60 prominent men, 10 of whom were connected with steel foundries. This is one indication that the steel casting industry in America has been disposed to pioneer and co-operate for the improvement of the product.

Attach Importance To Appearance

The related subject of sand control, surface appearance, final degasification and the use of aluminum as outlined by Captain Shane, suggested to Major Bull that perhaps foreign steel founders attach more significance to surface appearance and less to the physical characteristics of the metal than do American foundrymen. Certainly the overseas requirements considered collectively, for ductility in specifications for cast steel, are less impressive than those in specifications for steel castings as adopted by the United States navy and army; the American Society for Testing Materials and by numerous large consumers of steel castings throughou the country.

In four separate specifications for steel castings developed by the British Engineering Standards association (laterly re-named the British Standards institution) there is no requirement for reduction of area, yield point, proportional limit or elastic limit. Metallurgists now generally agree that reduction of area is a better index than elongation, to the ductility of steel. A fair average of the British standard specifications mentioned for carbon steel cast-

ings presents the combination of minimum values of 26 tons for tensile strength and 20 per cent for elongation in 2 inches. Cold bend tests are called for in two of the four specifications and must meet the requirement of 120 degrees for the soft grades. Contrast these figures with the latest specification for carbon steel castings adopted by the American Society for Testing Materials, established as a standard in 1929. This calls for not less than 70,000 pounds tensile strength, 36,000 pounds yield point, 22 per cent elongation in 2 inches and 30 per cent reduction in area, for the grade of soft carbon cast steel used for most industrial and railroad purposes in America.

Major Bull points out that the connection between aluminum additions and surface appearance would not occur to the average consumer. Steel makers know that aluminum reduces the ductility. If the American steel foundryman attached less significance to solidity and ductility he could resort to practices in mold and metal making which probably would result in better surface appearance of the casting, thus providing superficial evidence of a superior product. Actually the casting might show a falling off in homogeneity, ductility, shock resistance, or, in all three. The foregoing relates particularly to green sand practice. Surface appearance of a casting made in a dry sand mold, where other conditions are equal, is more satisfactory than that of a casting made in a green sand mold.

Shows a Progressive Spirit

Further evidence of the progressive spirit of American steel founders is found in specifications for eight grades of alloy steel castings for structural purposes, extensively discussed in related committees of the American Society for Testing Materials. If and when these new specifications are issued the society will have in effect as standards or tentative standards, purchase requirements for three varieties of carbon steel for castings (identified by tensile properties) one variety of high alloy steel (austenitic manganese) and eight other varieties of alloy steel, the latter for structural purposes and distinguishable by physical properties and heat treatment specified.

In the light of these purchase requirements for 12 varieties of steel which stress physical tests above other considerations, Major Bull concludes after scrutinizing foreign specifications for steel castings, that the American foundryman has taken the lead in co-operating with the consumer to develop purchase requirements that emphasize the quality of the metal.

He is inclined to agree with the criticism heard abroad by Captain Shane touching on the haste exercised in American steel melting. No experienced steel foundryman will deny that excessive speed in finishing a heat of steel either in the open hearth or electric furnace is likely to lower the quality of the metal. However, the criticism, like all criticisms of a general character, takes in too much territory. Probably it is based on instances of heavy production where strong pressure is directed to the melting department for delivery of metal to the molding floor. Depending on shop conditions at a period of this kind, only an exceptionally strong minded general superintendent or works manager can adhere to the policy of moderate speed melting.

He thinks that steel foundrymen generally will endorse the opinion reached by Captain Shane that metal should not be poured at a higher temperature than that required for any given casting. Experience in eliminating all possible causes for shrinkage defects and tendencies of the sand to *burn in* on the casting face shows the desirability of pouring at a temperature merely hot enough to completely fill the mold cavity with proper delineation of detail.

Referring to the incident in which Captain Shane saw two barrels of water dumped over the risers in a French foundry Major Bull doubts if any steel foundryman could argue convincingly before his experienced colleagues for a sudden crude chilling of a sink head. The idea is in direct opposition to all accepted theory and practice.

Meticulous examination of castings intentionally machined destructively has disclosed the fact external and internal chills of the proper kind may be used economically and satisfactorily in preference to excessive weight in the risers. The place to eliminate chills is on the drawing board. Chills are effective when the design of the casting is such that a perfectly solid condition cannot result from pouring the mold in any position that will permit adequate feeding. This point should be emphasized for the benefit of designing engineers, who occasionally send a job to the foundry with objectional characteristic necessitating manufacturing expedients expensive for seller and buyer. Buyers are prejudiced when these devices are used unskillfully.

Staff Examines the Drawings

Preliminary examination of the drawings by foundry executives and the prevailing custom of foundries making their own patterns in European foundries mentioned by Captain Shane are most commendable. If universally applied in this country they would do much to improve the quality of steel castings, reduce the first and sometimes the ultimate cost to the buyer.

The method described by Captain Shane in one foundry where coreboxes take the place of patterns and where the (*Please turn to page* 60)

Collecting System Is Flexible

Eastern foundry develops apparatus for removing dust from swing frame grinders

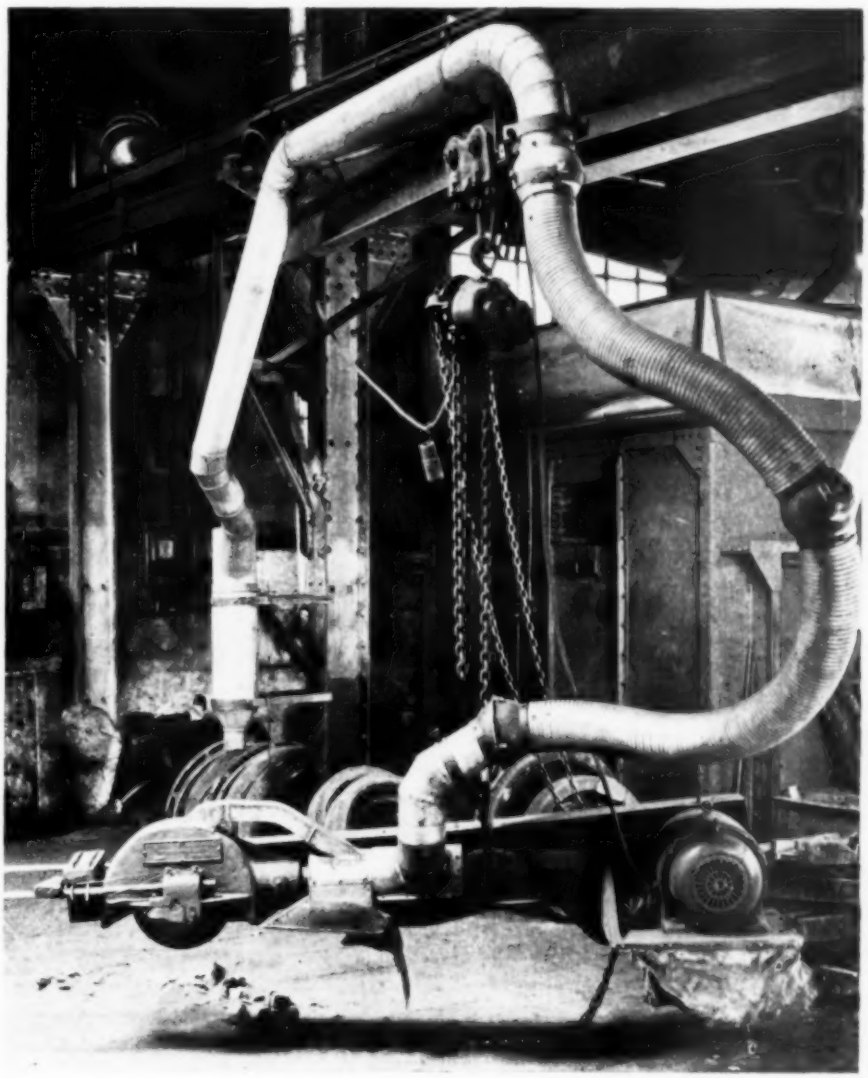
ENGINEERS of the Hunt-Spiller Mfg. Corp., Boston, have developed apparatus for collecting the dust from swing frame grinders as one feature of its good housekeeping program. Although it often is difficult to collect this dust without restricting the movement of the grinder, it is pointed out that this equipment does not present such interference to ease in handling the machine.

Such difficulties have been overcome by a number of features employed on the installation, which is shown in the accompanying illustration. A revolving bonnet has been placed on top of the cyclone arrester, as shown at the left, so that the entire device is permitted to swing with the crane supporting the grinder. A flexible steel pipe permits oscillation of the grinder.

A swivel bonnet to which the draft pipe is connected surrounds the drive shaft to permit longitudinal rotation of the frame of the grinder. Sparks and dust from the wheel pass through the open throat of the collector and are interrupted by a flexible damper which is sufficient to retard their velocity and to permit all but the heavier particles to be carried up into the equipment by the suction from the dust arrester unit, which is located outside of the building and to which the entire device is connected.

Experience also showed that the connection at the top of safety hood which surrounds the wheel is of considerable advantage in picking up dust carried into the hood by the rotation of the wheel.

The Hunt-Spiller company also employs a portable vacuum cleaner of the industrial type to prevent the accumulation of dust and dirt in its powdered coal plant and other departments of the foundry. The electrically driven unit is used to clean off the walls, the tops of bins, the runways of buildings and other places rather difficult to reach. The walls of the building have been painted white.



A revolving bonnet on the cyclone, and flexible steel connecting pipe permit freedom of operation. The connection at the top of the safety hood is of considerable value

Leaded Bronze Is Affected by Alloys

Tests are made with small quantities of phosphorus, aluminum and silicon

By HAROLD J. ROAST
McGill University, Montreal

TROUBLE incident to the fracture and outward appearance of certain leaded bronze castings led the author to conduct a series of experiments on the probable effects of comparatively small quantities of aluminum, phosphorus and silicon in the scrap forming part of the charge from which the castings were made. The castings contained from 7 to 8 per cent tin, 21 to 25 per cent lead, 2 per cent zinc and the remainder copper.

For purpose of identification the experimental castings were numbered consecutively from 1 to 34, each number indicating some difference either of composition, pouring temperature, or both. The various heats were melted in 350-pound plumbago crucibles in a pit type furnace fired with city gas. Metal for experiments 1 and 2 covering casting groups 1 to 8; 9 to 12; 13 to 14 and 15 to 22, was poured into 5 x 9 A.R.A. journal bearing molds.

Driver Brass Weighs 300 Pounds

For experiment No. 3 the metal was poured into molds for a locomotive driver brass weighing 300 pounds. Heats for the journal bearings were made up as shown in Table I. The mixture used for the heavy driver brass is shown in Table II.

After pouring the test bearings from one pot of metal, 2½ pounds of silicon copper (10 per cent silicon) was added to the remainder of the metal in the crucible. Part of this metal was poured at 2200 degrees Fahr., and the remainder at 1900 degrees into castings Nos. 7 and 8. No change was noted in the appearance of the molten metal, but at both high and low temperature a peculiar greenish-grayish-whitish powder swirled up from the sprue and settled around the opening. This flocculent powder contained fine globules of copper colored metal mixed with a whitish powder. Analysis of the powder is shown in Table III.

Experiments Nos. 1 and 2 in which phosphorus at 0.08 per cent, aluminum at 0.49 per cent and silicon at 0.08 per cent, were added to the journal metal, indicate that:

(a) Phosphorus alone is the least inimical to good surface appearance and fracture.

(b) Aluminum affects the outside of the journal casting, and tends to spoil the fracture especially at the higher casting temperature.

(c) Phosphorus and aluminum are worse than aluminum alone.

(d) Silicon, or phosphorus and silicon, destroy the surface of the casting and color the surface

Table I

Composition of Metal in Tests On A. R. A. Bronze Bearings

	Pounds	Per Cent
Clean copper wire	245	70
Tin	21	6
Lead	73½	21
Zinc	10½	3
Total	350	100

Table II

Analysis of Powder from Metal With Silicon Addition

	Per Cent
Silica	18.65
Lead	8.69
Iron and alumina	1.42
Zinc	60.30
Copper (by difference)	10.94
	100.00

Table III

Composition of Metal in Tests On Locomotive Brasses

	Pounds	Per Cent
Copper	262½	75
Tin	28	8
Lead	52½	15
Zinc	7	2
Total	350	100

dead white, but do not affect the fracture to the same extent.

(c) Continued remelting largely will eliminate phosphorus and silicon, and to some extent aluminum also.

Following the first set of experiments, a second set was carried out partly as a check and partly to observe the effect of smaller amounts of aluminum, phosphorus and silicon. To this end 0.05 per cent of these elements were added to a charge of 350 pounds of synthetic journal metal. Some of this metal was poured at a temperature of 2300 degrees Fahr., and the remainder at 1900 degrees.

In the castings poured at the higher temperature the surface appearance was satisfactory. The fracture was not gray but light golden and showed a line of actual separation somewhat near the upper surface of the fracture running longitudinally for two-thirds of the length of the bearing.

Good metal, free from phosphorus, aluminum and silicon, if poured at a sufficiently high temperature, will give a fracture that is in the main golden-colored and has no steam flash but will separate under shock, and will give evidence of dendritic structure similar to that produced by silicon.

Surface Appearance Satisfactory

The surface appearance of the castings poured at 1900 degrees was quite satisfactory. The fracture was gray throughout, free from any sign of separation, and contained no golden areas and no evidence of steam flash, brown or otherwise. This emphasizes the importance of temperature in making castings.

One-third of the original alloy was then taken and an amount of phosphor-copper equivalent to 0.05 per cent phosphorus was added and journals cast at 2200 degrees Fahr. (No. 17) and at 1900 degrees Fahr. (No. 18) The fractures in both cases were gray with little golden crystals interspersed, but no large central areas and no steam flash.

To another one-third of the original metal an amount of silicon-copper equivalent to 0.05 per cent silicon was added. The first castings were made at 2200 degrees Fahr. (No. 19) and the others at 1900 degrees Fahr. (No. 20)

From this second experiment it is evident that phosphorus up to 0.05 per cent may not give any trouble, although it is the author's opinion that it is better kept around 0.02 per cent. It is evident that 0.05 per cent aluminum is absolutely detrimental to the appearance of the casting and dangerous to the fracture, and that the same may be said of 0.05 per cent silicon. These conclusions are based on journal metal of the composition stated. The same additions to alloys of different composition might well show different results.

A similar line of investigation was undertaken on the effects of temperature and of additions of 0.05 per cent phosphorus, aluminum and silicon on a locomotive driver weighing 300 pounds, using metal of the composition shown in Table III.

The same melting procedure was followed. One driver was cast at 2100 degrees Fahr. (No. 23), the other at 1900 degrees Fahr. (No. 24) These were left in the sand one hour, then removed, sand brushed off, cooled for another hour on the floor, then put outside for one hour, where the temperature was 32 degrees Fahr., and then broken.

These castings were uncomfortably warm to the hand, but showed no evidence of oxidation. No. 23 had a well-defined chill to a depth of ⅛ to ¼ inch, and a uniform cross-section for the remainder of light golden crystals intermixed with lead-colored crystals. There was absolutely no sign of intercrystaline shrinkage or longitudinal separation of dendrites. Casting No. 24 presented a similar appearance except that the proportion of golden crystals was less. The casting showed no sign of shrinkage.

These castings and gates were put back in the pot and heated to 2200 degrees Fahr. and 0.05 per cent phosphorus added as 15 per cent hosphor-copper. Similar castings were made at 2100 degree Fahr. (No. 25) and at 1900 degrees Fahr. (No. 26)

Little Difference Apparent

Little difference, if any, was noticeable in the color of the fractures as compared with Nos. 23 and 24 made from virgin metal, except that No. 25 ate a little more into the sand. Apparently 0.05 per cent phosphorus or less (some may have been used up in deoxidizing) is not a critical factor in drivers.

The next engine driver (No. 27) was cast at 2350 degrees Fahr. This casting showed some strain fins but no swelling and no shrinkage. The fracture was satisfactory, the usual chill of ¼-inch or so was noticeable, and the general fracture was that of light yellow crystals with a few lead-colored crystals intermixed. Fine holes were evident, generally distributed. There were no dendrites and no sign of incipient shrinkage.

The second driver (No. 28) was cast at 1900 degrees Fahr. This casting was free from strain fins and showed no sign of general shrinkage. The general fracture was similar to that of No. 27, except that it was more leady in color; with few minute gas holes.

The second pot was brought up to 2350 degrees Fahr. and cast at 2300 degrees Fahr. for the first mold (No. 29), and at 1900 degrees Fahr. for the second mold (No. 30). Both castings were similar to Nos. 27 and 28 in appearance and fracture, except that No. 29 showed a slight indication of incipient orange spots in the fracture, but no separation or dendrites.

These four castings (*Please turn to page* 45)

Producing Small Steel Castings

Molding sand probably is most important factor, especially in green sand practice

By RALPH BURKE

CLASS of work, types of sand, and foundry equipment and methods vary so greatly from one foundry to another and from one district to another that practices productive of good results in one shop may not always give the same results in another. However, there are certain basic principles which, if intelligently analyzed and interpreted in terms of local conditions, will apply to all shops.

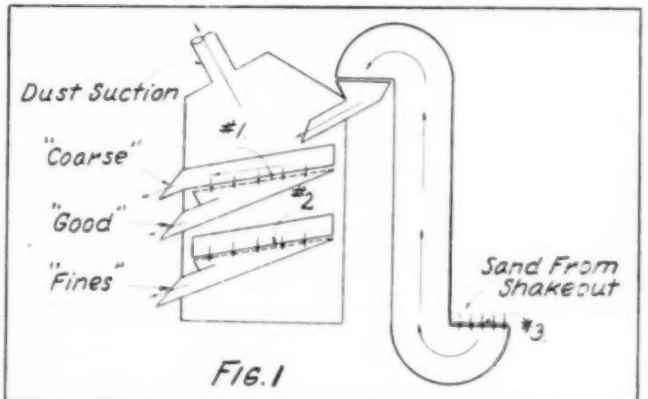
Probably the most important factor in production of steel castings is the molding sand, particularly in green sand practices. To meet present day practices, and competition, a steel casting must be strong enough to do all that is required of it in the finished product, it must match a forging for looks, permit machining and fabricating at a satisfactory cost and in general satisfy the user of its all around integrity.

Sand Has High Permeability

Since often defects in steel castings can be traced to gas holes, blows etc., the natural tendency of the steel foundryman is to use a molding sand of high permeability. In most cases this means a coarse sand, which may carry a rather high proportion of fines before it *closes up* enough to render it unfit for use. Coarse sands against the pattern give a rough appearance on the surface of the casting even if entirely free from adhering or burned on sand, and are more likely to cause burning on than finer sands. This is due to the penetration of the molten steel into the spaces between grains, the steel partially surrounding the grain and holding it. Due to this gripping effect the coarser sands are also more prone to wash and cut by the moving metal. A fine sand will give a smoother appearance and a cleaner casting provided it can be made permeable enough to allow free exit to the gases or steam formed when the molten steel fills the mold. Such a sand can be made in the foundry, and safely used with excellent results if certain basic principles are understood and applied.

In making a suitable molding sand, first provide means to insure absolute uniformity within specified limits. Not only should the sand mixture contain definite proportions of binders and water, but it should carry certain definite amounts of sands of known grain size, and be milled to a uniform and specified moisture content, permeability and bond. While some new sands are fairly uniform in that respect, economy of operations requires that this sand be used over and over. Each cycle of use of the sand alters its characteristics, particularly in respect to grain sizes. Some means must be provided to bring the used sand back to some uniform starting point before using again.

Many foundries are equipped with reclaimers. All that is required of a reclaimer is that it consistently will separate the used sand into three parts; good sand of definite grain size limitations, fines, and coarse particles too large for



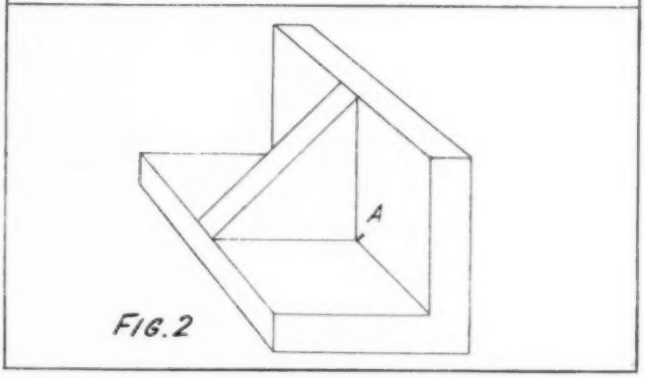


Fig. 1—Example of a reclaiming unit for steel foundry sand
Fig. 2—A vent at A will prevent a draw at the corner

use. The coarse particles also include foreign matter, wood particles, metal shot etc., and the fines include the dust as well as merely sand too fine for use. A simple type of reclaimer is shown in Fig. 1.

Many variations of this reclaimer can be made depending on local conditions, plant layout tonnage etc. The inlet side may be hooked up to a shake-out belt or screen; the outlet side may be connected to belt or elevator carrying the sand to hoppers over the sand mill or elsewhere. Mechanical means of taking away the fines and coarse particles may be provided, but to get a uniform sand, the reclaimer must provide a finished *good* sand of fairly uniform grain distribution, free from dust, and a supply of *fines*, also free from dust. By *dust* is meant that which is shaken free from the dry sand during the reclaiming operation, and removed by the suction fan.

Dust Removed by Suction

Screen No. 1 is shown in Fig. 1, is the coarser of the two screens. Material remaining on the No. 1 screen is the *coarse*, and is wasted. Material passing through No. 1 screen and remaining on No. 2 screen is the good sand. Material passing through the No. 2 screen is the fines, some of which is wasted, and some of which is proportioned back in the various mixtures. The dust is removed by the suction.

Selection of screen sizes depends on original condition of new sand, on suitable refinement of separation and advisable amount of waste. Some experimentation is required to get the right combination, but once established, should not have to be changed. A fair average for small castings is 30 to 50 mesh for the No. 1 screen, and 40 to 60 mesh for the No. 2 screen. Further refinement of grain selection can be made with more than two screens, but for usual conditions two screens give excellent results. To protect the No. 1 screen from damage from gaggers etc., a coarse screen or grating may be used at No. 3. This may be done better with magnetic separation before feeding the sand to the reclaimer. A crusher is used in some foundries to break up the lumps, reducing the loss from too much coarse. In others the lumps are broken by hand as they come off the No. 1 screen, and then are passed through the reclaimer a second time. It is essential that the entire outfit be enclosed tightly, so that the suction may operate efficiently, and a dusty condition in the foundry will be prevented.

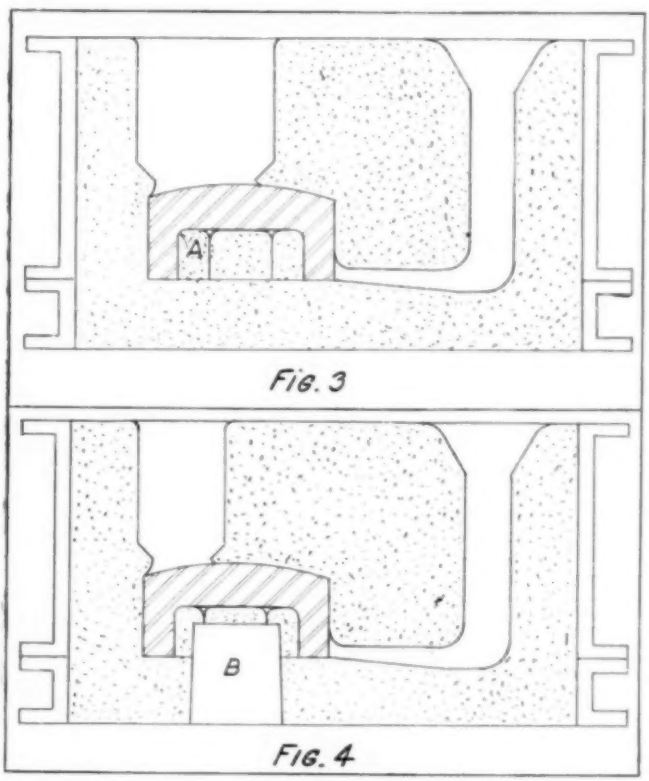


Fig. 3—The foundry making this casting encountered a draw at the corner A. With the center portion, B, hollowed out the difficulty disappeared

Dry Sand Prevents Clogging

Sand must be dry as fed into the reclaimer to prevent clogging of the screens and allow proper separation. This can be accomplished by shaking out on two piles, leaving the castings in the first pile until the sand dries, in the meantime shaking out on the second pile. With moisture contents advocated later, drying out of the sand is not a serious problem.

Examination of the fines will show heavy bond. If mixed with water it will form a heavy, sticky mass, too gummy to ram, and becoming extremely hard if dried in the oven. Some foundries use some of the fines, mixed about 50-50 with new sand, for lining shank ladles. Fines also are used as the sole binder in certain kinds of slab cores and for backing up core molds. Used in this way together with the fines used in the regular sand mixtures, the loss through fines is practically nothing.

Assume that the following materials are available to make up sands needed in the foundry:

1. *Good* sand. A dry, fairly uniform sand, free from dust. Each grain coated with a film of dried binder, giving the grain the appearance of being larger than is actually the case.
2. *Fines*. A dry, heavily bonded sand, free from dust.
3. New sand, preferably of two kinds.
   a. Fine grain, washed and dried.
   b. Coarser grain, raw sand.
4. Various dry and liquid binders.

Since the types of new sand vary with locality in shape and size of grain, and in natural bond, it is not practical to state definite sand mixtures. Some mixtures in terms of their physical make-up follow: (*Please turn to page* 52)

Weigh All Air Entering the Cupola

Blower is adjusted through a scale based on thermometer and barometer

By ALEXANDER W. WESTON

ANY FOUNDRYMAN operating a cupola equipped with a positive pressure blower may improve his cupola operation and effect a substantial saving in melting cost without great expense. Benefits include a saving in fuel due to increased thermal efficiency; hotter iron; less patching in the melting zone; greater uniformity of operation; a saving in power required to operate the blower; lower loss of silicon and manganese by oxidation; less sulphur pickup.

To get the best possible results in the melting operation of a foundry cupola, all variables should be under control. The principal variables are iron, coke and air. The iron and coke readily may be regulated, but since the condition of the air varies from day to day, control of that factor requires somewhat greater attention. The average foundryman carefully weighs iron and coke charges, but he does not give the same attention to the air blown into the cupola. The cupola may be equipped with a volume meter (in some instances it isn't) which shows the number of cubic feet of air delivered by the blower per minute.

Proper Equipment Measures Air

This is not enough. The foundryman should be able actually to weigh the amount of air or that part of it—the oxygen—which produces combustion in the cupola. Control equipment necessary for this system of weighing and calculating cupola air includes a barometer and thermometer; a volume meter and an attachment on the blowoff valve of the blower. This latter feature is secured by inserting a screw in the weight, thereby enabling the operator to raise or lower the valve, thus allowing the escape of all air in excess of that necessary for proper operation of the cupola.

The bypass is calibrated simply with a 6-inch scale permanently connected to the blower in such a position that the operator is enabled to measure the opening for any given set of atmospheric conditions and volume of air required. In a short time the operator will have enough data to make up a chart and from this chart he quickly can adjust the bypass for the prevailing atmospheric condition. A variable speed motor will effect a power saving.

When one pound of carbon burns to CO_2, approximately 14,500 B.t.u. are produced. When one pound of carbon burns to CO only 4450 B.t.u. are produced, a loss of approximately 10,000 B.t.u. due to imperfect combustion. Obviously the foundryman should supply the proper weight of oxygen to burn the carbon in the coke to CO_2 and secure the maximum number of B.t.u. for melting and superheating the iron.

Theoretically 20.92 per cent of air is oxygen. For ordinary combustion calculation 21 per cent of the air is regarded as oxygen. The pound mol, 359 cubic feet, of oxygen under standard conditions, 14.7 barometer and at 32 degrees Fahr., weighs 32 pounds. The pound mol of air, 359 cubic feet, under the same conditions, 14.7 barometer and 32 degrees Fahr., will supply 21 per cent of 32 pounds of oxygen, or 6.72 pounds. However, air is not always standard. Conditions vary with pressure and temperature. For example, with the barometer at 14.2 and the thermometer showing 62 degrees Fahr., the pound mol, 359 cubic feet, will expand according to the following formula:

$$359 \times \frac{460+62}{460+32} \times \frac{14.7}{14.2} = 394 \text{ cubic feet}$$

With the barometer at 14.35 pounds pressure and the atmospheric temperature at 8 degrees Fahr., the result is:

$$359 \times \frac{460+8}{460+32} \times \frac{14.7}{14.35} = 350 \text{ cubic feet}$$

Thus under three varying atmospheric conditions it is apparent that 6.72 pounds of oxygen are derived from 359 cubic feet of air, from 394 cubic feet and from 350 cubic feet. A given number of cubic feet of air blown into the cupola do not supply the same number of pounds of oxygen from day to day.

Carbon content of coke determines its value as a fuel. The average melting point of gray iron is 2260 degrees Fahr. (*Please turn to page* 57)

Needs Elasticity in Labor Conditions

Steel castings industry presents production perplexities in meeting employment problems

By F. A. LORENZ JR.
American Steel Foundries, Chicago

THE steel casting industry of the United States represents an aggregation of persons, firms, and corporations engaged in the production and sale of steel castings. The invested capital of this industry is approximately $240,000,000. In normal times about 43,000 persons are employed and the estimated payroll in a normal year is approximately $85,000,000.

That industry has the same melting processes as the steelmaking plants of the steel industry and for the most part are concentrated in the same producing districts, or contiguous territory.

The steel casting industry is a capital goods industry and has suffered seriously in the 2 years just passed. Production dropped to the unprecedented low ratios of 25 per cent in 1931 and 10 per cent in 1932.

Throughout those periods, the industry spread available work and kept employes on the payroll when there was no production to justify it, thereby suffering a loss in productive efficiency. Statistics clearly show this.

Tons Produced Per Man Per Year by Processses For the Years 1929-1930-1931-1932

Process	1929	1930	1931	1932
Open Hearth	35.1	22.3	12.3	3.5
Electric	21.0	12.3	8.0	5.0
Converter	11.8	9.1	6.7	3.5
Crucible	8.4	4.3	4.7	2.6
All Processes	28.1	17.7	10.3	4.1

To one familiar with production in any of its phases, these figures indicate that all processes of producing castings were already suffering from too many men employed for the work in hand, as the output per man in 1931 was 2½ times the output in 1932 and that in 1929 was 7 times that in 1932.

This is a jobbing industry. Each order is for castings from individual patterns, in the specified amounts for that order only. There can be no such thing as over-production, as production depends solely upon demand. It is impossible to pile up stock to level off production schedules, as is possible in most other industries. Orders received by any individual company fluctuate widely from day to day and week to week. For the industry to measure its operations by any broad averages will work unfair hardships and limitations on many of its individual members. To compare the average number of workmen employed in normal times with those employed at the present time, to gage the absorption of new workers, even under the reduced hours in the code, would produce a misleading conclusion. A survey made the first of September, 1933, shows the *actual* number of workers now on the payrolls of the industry exceed the *average* number of daily workers by about 25 per cent, concrete evidence of sustained spread-the-work effort.

Rate of Bookings Increases

Within the past several weeks, the total tonnage of orders received has been increasing. The rate of bookings for the industry increased in July to 27 per cent for miscellaneous castings and 12.8 per cent for specialties—a weighted average of 20.5 per cent for the industry as a whole. The average minimum hours per employe in July was 37.9 per week. Average maximum hours worked was 54.1.

The major wage districts in the code of fair competition for the steel casting industry correspond to those set forth in the code of the iron and steel industry, although grouped within eight geographical divisions for administrative purposes. This grouping is similar to the sectional wage studies made by the research and planning division of the NRA.

The minimum wage rates in corresponding wage districts and hours of labor are identical with the rates and hours approved for the iron and steel industry. In the wage districts, set forth, the rolling mills are the predominating labor factor and always have influenced the minimum labor rates in the respective districts. The minimum rates for common labor, as provided in the code, represent increases in the first seven districts of from 12 to 33 per cent, over May-June 1933 (*Please turn to page* 38)

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, N. K. B. Patch

Use Alloys Possessing Greatest Resistance To Heat

Can you give us some information on a good mixture for stoker parts which are subject to high temperatures? What is the amount of alloys, if any, also the amount of steel scrap used in the charge? We would like to know the approximate amount of scrap iron, pig iron for best results, and if any steel, chromium or nickel should be used.

A number of mixtures are used for stoker parts some of which contain alloys and others do not. However, it is advisable to use alloy iron which will possess a greater resistance to heat than unalloyed iron. One suggested analysis for stoker parts shows 1.25 to 1.50 per cent silicon; 0.60 to 0.80 per cent manganese; total carbon 3.10 to 3.30 per cent; nickel 1.25 to 1.50 per cent, and chromium 0.50 to 0.70 per cent. That composition will contain from 15 to 35 per cent steel scrap in the charge.

For stoker parts that must withstand temperatures around 1500 degrees Fahr., it is claimed that an alloy iron containing nickel, copper and chromium will give good results. The suggested composition shows the following: 2.75 to 3.10 per cent total carbon; 1.25 to 2.00 per cent silicon; 0.60 to 0.80 per cent manganese; 12 to 15 per cent nickel; 5 to 7 per cent copper, and 1.5 to 4.0 per cent chromium. The nickel and copper content of the mixture is obtained by adding about 25 per cent of monel metal pig to the iron charge. The chromium is added in the ladle.

Since we do not know what materials you have on hand, or the cupola practice you follow, it is difficult to suggest the proportions of return scrap, pig iron and steel scrap to be used. However, with the analysis given, it should be an easy matter for you to calculate the iron charge for your cupola.

Add Phosphor Copper When Actual Deoxidization Is Desired

We would appreciate any information with reference to the time of adding phosphor copper to metal for bronze castings. Also do you recommend the use of 10 per cent or 15 per cent?

Use of phosphor copper as a deoxidizing agent is most effective when it is added at the time that the actual deoxidation is desired. In other words, if it is necessary to reduce the oxygen content in the copper before adding the tin, lead, zinc, etc., then the phosphor copper should be added to the copper at that time.

If it is desired to use phosphor copper simply as a fluidizer or something to increase the fluidity of the bath, then the addition should be made just before pouring. It is common practice to add a certain amount of the phosphor copper at the time the alloy is produced in the furnace and just before pouring to add the balance of the total desired, thus adding to the fluidity of the bath.

The 10 per cent grade is more largely used, we believe, as it is more easily produced to an accurate product; whereas 15 per cent is just a little above the saturation point of phosphorus and copper. It is thus necessary to have some free phosphorus present to reach the 15 per cent figure.

Mottled Structure Gives Heat Resisting Properties

Can you give me the proper mixture of gray iron for making revolving stoker grates? Our pig iron contains 3 per cent silicon, and is used 50-50 with machinery scrap. The grate bars do not seem to last long.

Rough calculation shows that the grate bars made from the 50-50 mixture contain about 2.25

per cent silicon which indicates a rather soft iron for that type of work. It will be difficult to give a definite mixture that will work satisfactorily as the average thickness of section of the bars is not known, nor do you state whether any machining is required. Also a difference in melting and molding practice will require changes in the mixture. White iron would be ideal as a heat resistant material, but it is brittle. Hence, in your grate bars, it will be advisable to approach the white fracture, but at the same time obtain some of the qualities of gray iron. A mottled structure iron will give those results.

To obtain such a structure, reduce the silicon content of your mixture by substituting some steel scrap for some of the pig iron. For example you might try reducing the pig iron to 300 pounds, making your mixture 300 pounds of pig iron, 200 pounds of steel scrap, and 500 pounds of machinery scrap. The resulting iron will contain around 1.75 per cent silicon.

Silicon Content Is Too High for Cast Iron Pistons

We are having considerable trouble with large pistons for ammonia refrigeration machines which show shrinkage and sometimes cracks. They are made from a mixture composed of 50 per cent steel scrap; 40 per cent medium silicon pig iron and 10 per cent silvery pig. The blast to the cupola is determined by a volume meter, and the temperature of the iron at the spout is 2700 degrees Fahr. as shown by an optical pyrometer. Pistons are 10 inches in diameter and about 30 inches long, and are poured on their sides with risers at each end and at the center. Risers are 12 inches high, 5 inches in diameter at the top tapering to 2½ inches at the casting. When the risers are knocked off the shrinkage holes are seen under them partly in the riser and extending down ⅜-inch into the casting. The analysis of the iron used is 2.40 per cent silicon, 0.60 per cent manganese, 0.30 per cent phosphorus, 0.100 per cent sulphur and 3.50 per cent total carbon. Do you think a semisteel mixture containing 20 to 30 per cent steel scrap would be more satisfactory? Will greater wear occur if the cylinder and piston are of the same composition; for example the semisteel mentioned?

From the blueprint accompanying your inquiry we notice that the thinnest section of the piston casting is ⅝-inch and that is only at a small portion near the piston pin bosses. The remainder of the piston barrel ranges from ¾ to ⅞-inch thick and the head is 1½ inches thick. Hence, we believe that the iron you are using for the pistons is much too high in silicon for the work. Our suggestion would be to use the same mixture that you employ for the cylinders, or if you do not want to use steel scrap in the mixture, eliminate the silvery pig iron replacing it with medium silicon pig.

The question of wear is an extremely debatable point as the conditions under which the two contacting surfaces operate are important. If the surfaces are adequately lubricated, the wear will be negligible according to some tests. If the surfaces are dry, the pressure between the two, and the type of friction such as sliding, etc., will influence the amount of wear.

Ferroalloys Permit Use Of All-Steel Scrap Charges

We have to dispose of 400 tons of 0.18 to 0.20 per cent carbon steel, and want finished castings with a brinell hardness from 365 to 380. The castings will be balls for cement grinding in 1, 2, 3 and 4-inch sizes. The balls must be hard and tough, but not brittle. What mixture would be the most economical to use as high a percentage of steel scrap as possible in the cupola?

All steel scrap charges with additions of ferromanganese, ferrosilicon and other ferroalloys are being used for the production of white iron grinding balls and high quality gray iron castings. The amounts of the ferroalloys used will determine whether the final structure will be white or gray. In your case, the balls will have a white structure, and hence, only a small quantity of ferrosilicon will be necessary.

Without knowing the inside diameter of your cupola, no information can be given on a suitable mixture except to say that you probably will find it necessary to add about 3 pounds of 80 per cent ferromanganese per ton of scrap charged to compensate for that lost during melting. The amount of 50 per cent ferrosilicon to be added will depend upon the content desired in the final iron. If, for example, that is 0.50 per cent, you probably will have to add 12 pounds of the ferrosilicon alloy mentioned. Instead of adding the ferroalloys in lump form, they may be purchased in briquet form which is said to increase the yield of the element added.

In melting all steel scrap charges, you may find it advisable to use smaller charges than you usually employ with gray iron. It is said that

the melting zone should be lined with silica brick for the best results. A mixing ladle at the spout will help in obtaining iron of uniform composition. White iron must be melted hot and handled rapidly as it begins to freeze at a higher temperature than gray iron.

Castings Rust Without Apparent Cause

Our grille registers and other light castings develop a coating of rust on the surface 15 minutes after they are shaken out. They rust again between the sandblast room and the plating room and the rust even comes out in spots after the castings are plated. This is our first experience of this form of trouble.

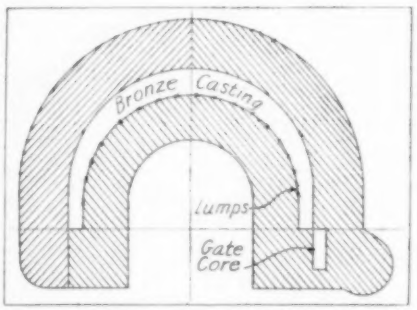
Instances are on record of rusty castings traced to cores made from salt impregnated sand or to molding sand wet down with salt water, but up to the present we have seen no reference to a virulent type of rust that persists through the sandblast and plating room. The only method of determining the cause in your case is to carefully check over all factors with particular reference to any recent changes made in the sand or in the method of preparation.

Permanent Mold Wears Rapidly in Service

We are making driving box brasses in an iron mold which shows no defect in machining, but which deteriorates rapidly in service. Small lumps appear on the surface of the inner part of the mold near the bottom as shown on the accompanying sketch. These lumps are about ⅜-inch in diameter and ⅛-inch high. When one of these lumps is chipped off a small hole appears in the surface. In a short period the entire affected surface peels off to a depth of approximately ¼-inch and to a height of 3 or 4 inches. The mold section varies from 1½ to 2 inches and the analysis of the iron is: Silicon 1.25 per cent, sulphur 0.09 per cent, manganese 0.75 per cent, phosphorus 0.25 per cent, total carbon 3.20 per cent. The brass enters the mold near the bottom through a gate core set in the iron mold.

Construction and operation of iron molds presents many difficulties only to be solved by slow and painstaking experiment and observation. Important factors include composition of the iron, metal thickness, position of sprue and gate, temperature limitations of the mold and the metal which is poured into it, pouring time, stripping, contraction and expansion. From the data submitted we are inclined to the opinion that you are burning the mold either by pouring the brass at an excessive temperature, or by pouring it into a mold that is too hot, possibly both.

The characteristic lumps to which you refer may be noted on grate bars, or other iron castings exposed to high temperatures for long periods. The defects do not show on the outside or concave mold sections because the contraction of the brass casting leaves a clearance on this face, while the same contraction causes the brass to hug the inside mold section closely. A constant stream of the hottest metal flowing



Section of permanent mold showing locality of defect

in at the bottom accounts for the higher temperature at the botom of tho mold and the subsequent deterioration in that vicinity. The obvious remedy is to cool the inside section of the mold by a jet of water or air, or, make an entirely new solid section which will not heat up so rapidly. Pour the brass at as low a temperature as is consistent with securing well defined castings. For interesting detailed description of permanent molds for railroad bronzes, see articles by Henry Marius in the Aug. 15, 1929 and Jan. 1, 1930 issues of THE FOUNDRY.

Leaking Tuyeres Due to Defective Cores

We have had considerable trouble with leaking copper tuyeres for blast furnaces. Do you think that the pressure system of gating applied to these castings would eliminate this form of defect?

This question can be answered by the single word, no. The principle on which pressure casting is based does not apply to such a thin walled casting as a blast furnace tuyere in which the metal solidifies almost instantly. Some foundrymen prefer to mold these castings big end up with a ring of pop gates on the top. Others prefer to mold the castings small end up with gates at the bottom. Satisfactory castings are produced by both methods.

One advantage of the big end down method is that the center core is formed by the pattern and remains on the drag. The jacket core must be anchored through the bottom board or plate. In the big end up method both center core and jacket core must be suspended from the cope and unless they are fastened securely one or both may shift a little and thus produce inequality in the thickness of the casting walls.

Leaking tuyere castings result from one of three causes, dirty metal, that is slag or foreign material in the metal or dirt washed in from the runner basin or gates; damp or hard mold or cores; oxidized metal. Careful supervision should eliminate the two first hazards. If the metal is melted properly, a small piece of phosphor tin—½ to 1.00 per cent—added to the metal in the ladle or crucible, will deoxidize it and assure a clean solid casting.

Lining in Cupola Burns Away Too Rapidly

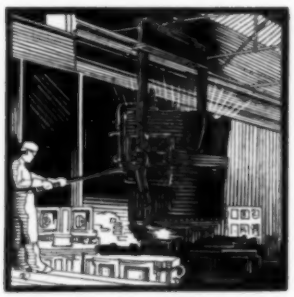
Cupola blocks in the melting zone of our 27-inch cupola only last for about 15 heats. Similar blocks in our large cupola last for 8 months. Blast is derived from a 6-cubic foot positive pressure blower running at 360 revolutions per minute. We tried this blower first at a speed of 240 revolutions per minute, but the iron was quite dull.

You do not state the length of time the cupola is in blast. Manifestly if the cupola is in blast all day the lining will not last as long as in a cupola running for an hour or two each day. For example the lining will burn away to a greater extent in one 10-hour heat than it will in five 2-hour heats. This factor is mentioned merely to indicate a reason for your trouble.

From other items in your inquiry we are led to assume that the cupola is utilized in the ordinary manner for heats extending from 1½ to 2 hours. The blocks burn out in a short time because the cupola is forced beyond its capacity. Your blower is delivering sufficient air to melt 4 tons per hour while the maximum melting capacity of a 27-inch cupola is only 2 tons.

Change your practice approximately as follows and the blocks will serve as satisfactorily in the small cupola as they have been doing in the large cupola: Provide a bed about 36 inches above the tuyeres. See that it is burned through thoroughly. Charge 700 pounds of iron, broken in fairly small pieces, and 70 or 80 pounds of coke. Adjust the blower, either through the motor or blowoff valve to deliver 1000 cubic feet of air per minute. Shut the blower off immediately the last charge is melted or even a few minutes before that time. Blowing air into an empty cupola at an incandescent temperature is a prolific cause of lining cutting.

Viewing Foundry Developments



At Short Range

A QUICK, reliable and practical method of checking the physical properties of cast iron during melting is the determination of the depth of chill in a test specimen. Generally thin chill castings are inclined to become soft, and, depending on the section, will produce shrink (contraction and segregation) holes. Increasing the chill will cause the defects to disappear and, although the structure becomes denser, the machinability of castings of medium sections will not be changed materially. However, thin sections are likely to become hard. Presence of either softness or hardness can be corrected immediately by increasing or decreasing the cupola blast. One of the exceptions to this rule consists of the appearance of hardness at a low chill. This will happen if the iron has been superheated properly and then held in the pot under blast-off conditions for a period of time.

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IN A RECENT series of tests to determine the effect of sulphur and iron on the physical properties of a cast red brass of the following analysis: Copper 85 per cent, tin 5 per cent, zinc 5 per cent and lead 5 per cent, it was found that the pouring temperature had a marked influence on the tensile strength, brinell hardness, electrical resistivity and density of the sand cast bars, which was decidedly greater than the influence exerted by the added impurity.

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The charge should be put into an open-hearth furnace as quickly as possible, but the materials should not be piled so high in the furnace as to deflect the hot gases onto the roof, and the furnace should not be chilled unduly.

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To prevent the sand from arching or hanging up in the hoppers over the molding machines a Michigan foundryman attached short chains in a criss-cross manner to bars above the hopper and to the gates at the bottom of the hopper. At the upper end the chains are suspended from coil springs which allow them to stretch when the gates are opened and which snap them back into place when the gates are closed. The result is that the sand in the hopper is agitated and kept in a loose condition each time the gates at the bottom of the hopper are opened and closed.

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Many cores used in a Midwest foundry are assembled on a sheet steel table heated by steam. The heat of the table is sufficient to dry blacking, daubing material and the paste between adjoining halves or other sections. It is claimed that this method is more convenient, economical and practical than the usual method of returning the cores to the ovens for a supplementary drying.

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TO ELIMINATE hard spots in castings, particularly those made of aluminum alloys, a patent has been granted on the application of two metal screens or sieves made of nickel cast iron through which the molten metal passes from the furnace into the pouring ladle. The upper sieve contains holes ⅛-inch in diameter while the lower ones contain holes 3/32-inch in diameter. It is said that the screens break up the metal stream causing the oxides and other undesirable impurities to be held back.

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Iron specimens exposed to water at high velocity lose more weight for a time than those exposed at a low velocity. After a month or so, the logarithmic curves are quite likely to cross, so that in the long run the specimens exposed at the higher velocities probably will lose less weight than those exposed at lower velocities.

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A Middle West foundry has found that impact test results give more reliable information on the ability of cast steels to resist shock in service than do test results on tensile strength and elongation. Grain structure as shown by the micrograph indicate the probable impact values. Heat treatments are of special importance. Similar steels given different heat treatments may give similar tensile strength results, but vary widely in impact resistance. Lack of ability to resist impact has been the cause of many so-called mysterious failures encountered in service.

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A recent patent claims that homogeneous copper-lead alloys of high lead content may be obtained by melting the metals with the addition of a relatively small quantity of beryllium ranging between 0.04 to 2 per cent by weight of the combined metals.

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USE of a small quantity of zinc oxide in sand bonded with sodium silicate for molds is claimed to increase the refractoriness, strength and water resistance in a recent patent. The sand mixture used was made from 86 pounds of 40 mesh sand and 1 pound of zinc oxide which was mixed in a muller. Then 11 pounds of sodium silicate, 42 degrees Baume, 3.25 to 1 ratio was added with enough water to bring it to working consistency. The mold made from the material was baked at 400 degrees Fahr. for 1 to 2 hours.

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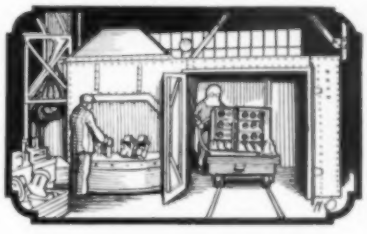
Growing dissatisfaction over all the extra trouble involved without corresponding necessity or result, induced the operating heads of the various interested departments in an

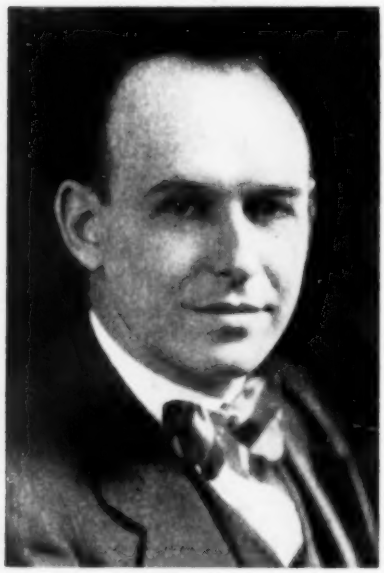


automobile manufacturing plant to hold an all day session with a view of eliminating several of the many special mixtures called for in each day's heat. As a result of this discussion, four of the former nine mixtures were dropped from the daily schedule without affecting total results.

Men of Industry

Whose Activities Are Making Foundry History

WILLIAM McWANE recently was elected president of the McWane Cast Iron Pipe Co., Birmingham, Ala., succeeding his father, the late James R. McWane, who founded the company, in 1922. J. D. SAMPLE, formerly vice president, has been made executive vice president and A. T. McWANE becomes vice president in addition to holding the offices of secretary-treasurer.



John D. Wise

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G. M. CARMICHAEL has resigned his connection with Fundicion y Talleres Mechanicos de Apulco, Apulco, Hidalgo, Mexico, and now is located at 1500 Quentard avenue, Anniston, Ala. For many years Mr. Carmichael was associated with the Welland Steel Castings Ltd., Welland, Ontario, Canada, as superintendent and for the past 2 years has been in Mexico, first with the La Consolidada, S. A., Mexico, in advisory capacity in the metallurgical department and then with the company at Apulco.

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E. D. CAMPBELL recently was made assistant general mechanical engineer, American Car & Foundry Co., with headquarters at Berwick, Pa. He will be succeeded as head of the engineering department in St. Louis by ALLEN W. CLARKE, formerly of the Jeffersonville, Ind., plant.

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J. H. JOHNSTON, formerly foundry superintendent, Cleveland works, Westinghouse Electric & Mfg. Co., has been made manufacturing engineer, Foundry and Micarta division, Pittsburgh. Mr. Johnston entered the employ of the Westinghouse Electric & Mfg. Co. in 1920, and in 1922 was transferred to the Cleveland works as metallurgist. He was appointed general foreman in 1926 and foundry superintendent in 1930.

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JOHN D. WISE recently resigned as assistant sales manager of the Osborn Mfg. Co., Cleveland. Mr. Wise was born at West Point, Miss. in 1895 and was graduated from Mississippi Agricultural and Mechanical College, Starkville, Miss. in 1915. He then spent a year with the Robbins & Myers Co. at main office in Springfield, O., and a year at the St. Louis branch of that organization. In 1917 he attended the second officers training school at Ft. Sheridan and later was made radio officer at Barron field, Texas. Following the war he became connected with the engineering department of the Osborn Mfg. Co. In 1921 he left that organization to become superintendent of the foundry laboratory, University of Illinois, Urbana, Ill. In August, 1922 he returned to the Osborn company where he was employed in the sales department. Later he was made assistant to the sales manager and in April 1929 became assistant sales manager. In addition, Mr. Wise also handled considerable of the work in connection with the patent applications of that company.

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W. WORLEY KERLIN, metallurgist technical department, Gray Iron institute, Cleveland, has resigned to accept the position of metallurgist, Superior Foundry Co., Cleveland. Mr. Kerlin received his technical training at the University of Michigan, Ann Arbor, Mich., where he specialized in metallurgy. After graduation he was employed as research chemist in the metallurgical laboratory of the Packard Motor Car Co., Detroit, and later he was made foundry metallurgist of that company where he also became interested in sand control. For 5 years previous to 1931 when he became connected with the Gray Iron institute, he devoted his time to core and molding sand problems, first with the Valley Mould & Iron Corp., Sharpsville, Pa., and then with the American Radiator Co., Buffalo, and the Enterprise Sand Co., Pittsburgh and Conneaut, O.

W. Worley Kerlin

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P. J. FLAHERTY, president, Johnson Bronze Co., New Castle, Pa., has been elected president of the Cast Bronze Bushing institute.

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H. P. MUELLER, president, L. J Mueller Furnace Co., Milwaukee, recently was elected a director of the Warm Air Furnace Manufacturers' institute.

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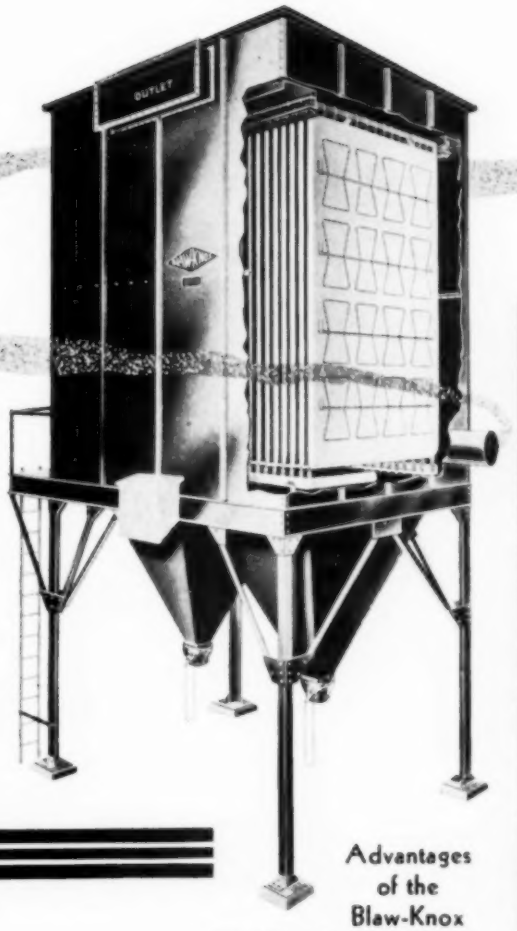
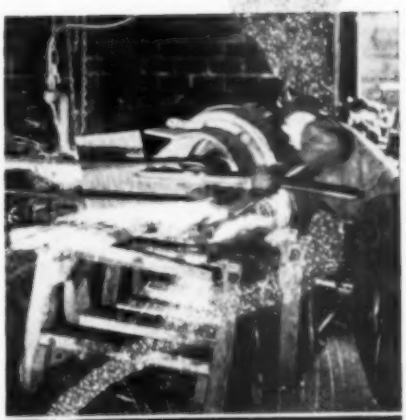
H. A. LOMAX, formerly with Pittsburgh Steel Foundry Corp., Glassport, Pa., is now connected with the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

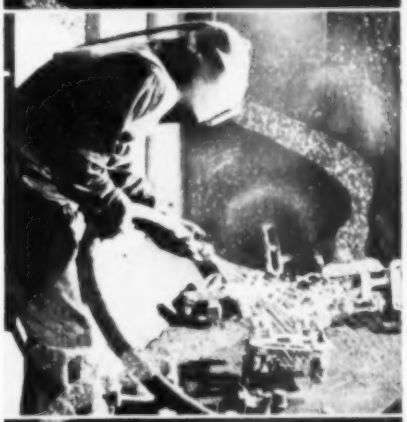


COMPLETE DUST REMOVAL

means More Work —Better Work



GRINDING



SAND BLASTING

SHAKEOUT FLOOR

The Grinding Hazard—

Blaw-Knox Steel Framed Bag Dust Collecting Systems are designed to meet all legal requirements, enabling foundries to comply with their state laws.

In the Sand Blast Room—

Blaw-Knox Dust Collecting Systems increase the visibility in the sand blast room. They clean the abrasive and prevent the spread of hazardous fines.

On the Shakeout Floor—

Increase mold permeability by controlled removal of fines and burnt sands and clays. Uncontrolled dust at the shakeouts is the largest source of foundry atmosphere contamination.

Let Blaw-Knox show you how to free your foundry from dust hazards, how your equipment can be modernized to make your foundry a safe working place. • Clean foundries make more and better castings for less money. • If you have a dust problem—Blaw-Knox can solve it.

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2097 Farmers Bank Building, Pittsburgh, Pa.
Offices in Principal Cities

Advantages of the Blaw-Knox DUST COLLECTOR

PROPERLY PLANNED AND ENGINEERED—
The Blaw-Knox engineering staff is recognized as an authority on the subject of dust collection. Experience with every kind of dust problem enables them to plan an economical and thorough installation.

POWER SAVING—
Less back pressure means more power efficiency with corresponding dollars and cents economy.

TAKES UP LESS SPACE—
Blaw-Knox Dust Collectors have the largest effective cloth area per sq. ft. of space occupied.

FIRESAFE STEEL FRAME—
All-steel bag separation frames mean reduction of fire hazard.

SIMPLICITY—
All parts sturdy and strong. Minimum supplementary equipment (valves, etc.) required.

LOW WEIGHT—
Light but strong construction throughout.

ACCESSIBLE—
EASY TO CHANGE BAGS—
Bags are changed in a fraction of the time usually required.

LOW ERECTION COST—
Made to fit. Bags are speedily adjusted and sealed.

BLAW-KNOX

BLAW-KNOX

STEEL FRAMED BAG DUST COLLECTORS

Question Code Cost Basis

Automotive castings makers object to small producers plan at malleable code hearing

A FRIENDLY but decided difference of opinion on ascertaining costs and selling below cost, between a small number of large founders and a large number of small founders developed at the hearing in Washington, Oct. 2, on the malleable iron code of fair competition.

Searching questions by H. O. King, deputy administrator of NRA in charge of the malleable code, indicated a thorough scrutiny of the cost features of the code as presented. Objectors to certain provisions of the code as written but members of the sponsoring group, the Malleable Founders' society, included the National Malleable & Steel Castings Co., Cleveland; Dayton Malleable Iron Co., Dayton, O.; and the Michigan Malleable Iron Co., Detroit.

Explaining article VI of the code, R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill., chairman of the Malleable Founders' society, declared that "fair and reasonable" and not average costs will be developed by the board of directors of the society.

Made to Order

Malleable castings, according to Mr. Fauntleroy, as a class are "tailor-made" and hence enormous diffculties have been encountered in adopting standard practice on costs. C. D. Gibbs, of the National company, an assenter to the code with reservations, pointed out the great variance in figuring overhead because of the wide range of capacity employed, and cited the possibility of producers unwittingly selling below cost and hence subjecting themselves to penalty.

If costs which are fair for small producers are applied to the large ones, especially in the automotive field, certain low cost producers would be compelled to sell above their normal price and hence might induce some of the larger users of malleable castings to build their own plants, according to Mr. Gibbs.

The average of inefficient and efficient plants would virtually result in price fixing, Mr. Gibbs charged. To the use of the word average Mr. Fauntleroy entered objections, claiming that "fair and reasonable" and not average costs were the objective of the Malleable Founders' society directors.

A. F. Jackson, representing the Michigan company, maintained that the efficient plant would be compelled to penalize its customers unjustly if a price fair to the entire industry were promulgated. He urged that each foundry install a uniform cost system and not sell below its own cost.

John C. Haswell, president of the Dayton company, testified that "the intricacies of malleable cost accounting are so great, and legitimate variations in the cost of a given casting, due to differences in equipment and practice, are so diverse that it will be impossible for directors of the society to arrive at 'fair and reasonable' costs which will properly govern individual concerns in their selling policies.

In January, 1929, employment in the malleable industry was 38,015 persons, representing 71.2 per cent of capacity, when the average work-week was 55 hours, according to Mr. Fauntleroy. By January, 1933, when the average week was down to 29 hours and the rate of operation 14.9 per cent, the number employed was 14,110. But by August, 1933, the malleable industry had recovered to an average work-week of 37 hours and a total of 22,320 employes, operations averaging 35 per cent.

According to Mr. Fauntleroy, at the 1929 rate of operations the adoption of a 40-hour week would require 48,469 employes. To employ as many as in 1929, or 38,015, a 55 per cent rate is necessary.

Consumers Simulate Fear

A limitation on any further advance in the price of malleables, except that occasioned by higher wages or materials, is proposed by the consumers' advisory board of NRA. Its proposed amendment under article XI of the code is as follows:

"Prior to Dec. 31, 1933, no member of the industry shall increase the sale price of his product sold after the effective date hereof over the price on July 1, 1933, by more than is necessary by actual increases in manufacturing, distribution or material costs or by taxes or other costs resulting from action taken pursuant to the agricultural adjustment act and/or this code since July 1, 1933, and in setting such sale price increases full weight shall be given to probable increases in sales volume. In case a member of the industry on July 1, 1933, was selling his product at less than actual cost he may take his cost price on that date as the base for such increase in selling price as is permitted by this section."

John W. O'Leary, president, Machine & Allied Products institute, offered his orthodox amendment exempting from the operation of the malleable code those manufacturers who produce their own castings. The O'Leary doctrine is that the foundry process being a part of the product, it should go with the product code.

P. R. Van Duyne, Meeker Foundry Co., Newark, N. J., proposed raising the maximum work week to 48 hours for foundries with a rated capacity of 1500 tons or less per year, the objective being to permit small foundries to compete with those having equipment and facilities for more than one shift.

Propose Labor Revision

Lawrence O'Keefe, president, International Molders' union, proposed revisions of the labor clause of the code. He suggested that the maximum average work week of 40 hours be reduced to 35 on the ground that the National Industrial Conference board reported malleable foundries operated 32.1 hours per week in the first half of 1933. The permissive maximum for any peak period Mr. O'Keefe would reduce from 48 hours to 40, plus time and a half for more than 8 hours a day or 35 hours a week.

Mr. O'Keefe proposed that 45 cents per hour instead of 40 cents be the minimum, he objected to a lower rate for female labor, suggested that the weekly minimum of clerical and office employes be $16 instead of $15, and took exceptions to repairmen being excluded from the limitation on hours.

Mr. Fauntleroy explained that only 7 per cent of the employes of the malleable industry are women, chiefly engaged in making light cores and sorting light castings.

To section 5 of article III permit-

(*Concluded on Page* 48)

Safe grinding speeds of 9,000 S.F.P.M.

CUT-OFF WHEELS bonded with Bakelite Resinoids are operating safely at speeds up to 16,000 S.F.P.M.

. . . . over 100 miles per hour

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Wheels bonded with Bakelite Resinoids have extraordinary strength, run cool and free, remove metal faster, and with less effort on the operator. They make full use of abrasive grit, which does not shed until it is worn. There is no gumming nor sticking and no offensive odors.

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THE MATERIAL OF A THOUSAND USES

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

ANY discussion of hidden defects in castings, dross inclusions, blowholes, segregation, shrinkage cavities and draws, naturally directs attention to the use of the x-ray as a medium for diagnosing these defects. Extended reference to the cost, installation and operation of the device is outside the scope of the present discussion. Interested readers will find reference to these features in a paper "X-Ray as Production Tool To Improve Quality of Aluminum Alloy Castings," by E. M. Gingeritch and H. J. Rowe, presented at the 1931 convention of the American Foundrymens' association in Chicago, and incorporated in the *Transactions* of that association. However, excerpts from the paper bearing directly on casting defects traceable directly to the improper application of gates and risers, seem to be germane to the general subject and quite properly may be included in the present series.

Material Absorbs Rays

One of the distinguishing characteristics of x-rays is their ability to penetrate matter which is opaque to ordinary light. Like visible light, x-rays travel in straight lines from their source, decreasing in intensity as they are absorbed by the various media through which they pass. Roughly, the absorption coefficient of a material is proportional to its density. Dense and heavy material, for example iron, absorb the rays to a greater extent than a less dense material such as aluminum.

Through this property it is possible to study the heterogenity of opaque material. Strictly homogenous material of uniform thickness will absorb equally throughout any exposed area, while the presence of less dense material such as gas inclusions, or more dense material such as heavier metallic segregations will decrease or increase the absorption.

Therefore, x-rays on passing through opaque material present an invisible shadow picture composed of shadows of different density, corresponding to the accumulated absorption of the various materials through which the rays have passed.

Experience has shown that radiography is an efficient tool for developing and controlling foundry technique. X-ray equipment eliminates the necessity of fracturing or sectioning castings to determine their soundness, thereby avoiding the destruction of the casting.

Use of x-ray equipment in the foundry eliminates the destruction of castings by sectioning and insures adequate inspection. This feature supplemented by controlled foundry technique has made it possible for the engineer to use castings with a greater assurance of safety. Parts heretofore made by more expensive methods of fabrication owing to the insufficient reliability of castings, now are being cast to a greater extent.

Under suitable conditions it has been found possible to detect cavities $\frac{1}{16}$-inch thick in an aluminum alloy casting 8 inches thick, provided the cavities are located in the half of the casting nearest the film. Cavities smaller than this in sections of this thickness, even though present, could not be detected on the radiograph. In sections of aluminum alloy castings 2 inches thick, cavities have been detected as small as $\frac{1}{64}$-inch in thickness, while in sections of ½-inch or less, pin hole porosity that cannot be seen on a machined surface, can be detected.

Aluminum alloys through their relatively low density, lend themselves much more readily than some of the more dense ferrous and nonferrous alloys, to x-ray examination. Certainly the x-ray is not a foundry *curcall*, but becomes an extremely handy tool when properly used and the resulting knowledge properly applied.

Up to the present, the majority of alloys which show high physical properties, develop a tendency toward greater internal shrinkage in the casting. Defects of this kind can be more readily detected by the x-rays, than by any other means. Therefore, defects of this kind readily can be prevented by proper correlation of examination and foundry technique.

Variables Affect Quality

Previous reference has been made to the fact that a number of foundry variables affect the quality of the castings. Proper location and size of the gates, risers and chills, moisture content and physical properties of the sand, composition and construction of the cores, are fully as important as the alloying practice, the melting practice and the pouring technique.

Unfavorable effect of any of these variables usually is detectable by *x*-ray examination. Porosity, shrinkage and cracks are the most common internal defects to be found in aluminum alloy castings. Usually they are the result of unskilled foundry practice, readily corrected after an x-ray examination of the casting discloses the exact source of the trouble. Reference already has been made to the injurious effect of pouring metal from an excessive height, through an unsatisfactory type of gate, at a speed too high or too low for the individual casting, or at an unsuitable temperature.

Design of many castings presents a challenge to the foundryman con-

(*Concluded on Page* 37)

Use the X-Ray

CASTING defects may be classified under two general heads, those which are visible to the naked eye, and those which are concealed in the body of the casting. The experienced foundryman can draw conclusions from the visible defects and then apply the remedies based on experience. Hidden defects constitute a menace, not only to the user of the casting through failure in service, but to the foundryman in the loss of subsequent orders. Formerly, the only method of discovering these hidden defects, was to break the casting, or saw it apart through the suspected areas. Recently, several foundries have installed x - ray apparatus for preliminary examination of castings at the beginning of a production run, and for subsequent examination of a limited number as a routine check on the practice established as a result of the first examination.

ADVERTISING PAGES REMOVED

(*Continued from page 34*)

fronted with the problem of using certain aluminum alloys whose casting characteristics are not exceptionally good. In instances of this kind it is imperative that the foundryman should have at his command some method of determining whether or not the castings are sound. Sandblasting will uncover blowholes or other forms of defect if they are on or close to the surface of a casting. Where the defect is present in the interior of the casting the x-ray is particularly adapted for the detection. Necessary changes in foundry technique then can be introduced to eliminate the cause of the blowholes.

Porosity in sand castings in many instances is due to the difficulty experienced in controlling the shrinkage during the period the metal is passing from the liquid to the solid state. Porosity may be prevented, or greatly reduced by careful control of all the foundry factors involved, temperature of the metal, pouring practice, gating, chilling and feeding.

In many instances a number of changes and various combinations of factors may be necessary before a satisfactory technique is developed. X-ray examination of castings affords a rapid check upon the result of each successive change and in this respect is a valuable aid to the investigator.

Application of the x-ray materially has aided in the development of aluminum alloy cylinder heads and pistons for air craft engines. Design of these parts is far from simple and the casting characteristics of the alloys most suitable for the purpose are not of the best. Porosity, shrinkage and dross inclusions figured prominently in the early attempts. Changes in foundry technique based upon the findings of x-ray examinations has resulted in the production of flawless castings.

Shrinking May Not Show

Solidification shrinkage may take the form of pin hole porosity. This usually is found where light and heavy sections are joined in the same casting, and where adequate provision has not been made for feeding the heavy section. A shrinkage defect may or may not show on the surface of a casting. This type of defect may seriously affect the strength of the casting and cannot be tolerated in castings subjected to severe service stresses.

The x-ray is especially valuable in detecting this type of defect. Usually the only remedy required is to increase the size or number of feeders. In some instances a change in the position of the gate is all that is required as illustrated in Fig. 216. The casting with a gate and risers as shown at *A* developed an internal shrinkage crack in the rib indicated at *C*. Under the same risers, but with the gate changed to the position shown the crack disappeared. In the first instance the gate *drew* metal away from the hub or boss, while in the second instance, the gate merely served its primary purpose of introducing metal to the casting.

Development of a foundry technique apparently satisfactory for a production casting does not mean necessarily

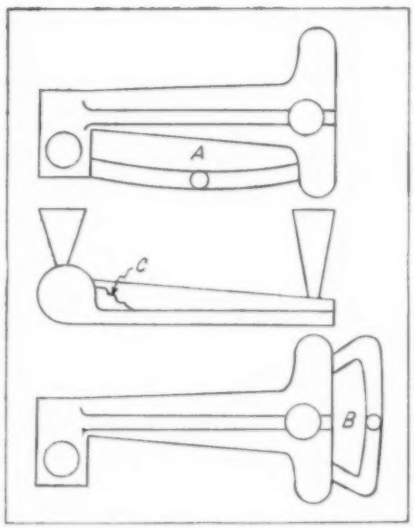


Fig. 216—Shrinkage which appeared when the casting was gated as at A disappeared when the casting was gated as at B

that this technique will continue to serve satisfactory indefinitely. In other words some castings fail to *stay put* and occasionally will develop some defect, for reasons often difficult to determine.

Defects of a surface character may be detected readily and proper measures may be taken to correct them. If the defect is internal, for example shrinkage or porosity, a number of castings may have to be made before the proper preventative measure can be applied. For this reason good practice suggests a periodic check upon the quality of production castings. While this sometimes may be done by fracturing or machining the castings, it can be done more quickly and more accurately by the use of the x-ray. In addition to the efficacy of the method, the casting is not destroyed.

Interpretation of radiographs and identification of various defects shown upon an x-ray film, is not always an easy task. Considerable experience is required on the part of the operator in comparing radiographs with the actual sectioned casting, to determine the nature of the defects, or to interpret the film satisfactorily. In extreme instances the nature of the defect cannot be determined from the film. However, usually this condition may be corrected by a second exposure of the section in another plane.

Limitation of the capacity of the equipment naturally limits the thickness of section which can be examined accurately. Several other factors may affect the final interpretation of a casting radiograph. Surface irregularities of a casting are reproduced and care must be exercised to see that these are not interpreted as internal defects. Oxides, cold shuts and dross in thin films may be present in a casting in a plane perpendicular to the x-rays in an exposure. In a radiograph these may be missed because the defect constitutes such a small part of the section.

Different types of defects in various planes of a casting often are superimposed on a film and may lead to misinterpretation. These hazards are eliminated by taking x-ray exposures at different angles.

Conditions under which the radiograph is examined should be controlled carefully. A viewing box is desirable, supplied with a variable source of diffused light, and in which the negative to be examined can be placed. The box should be placed in a darkened room so that all the light that reaches the observer comes through the film. Adjustable shields make it possible to view only these sections which are of interest.

Radiographic examinations are of little economic value unless the observed results are used to improve foundry practice. X-raying castings merely for inspection purpose without applying the knowledge gained to the improvement of future casting practice, is expensive and practically useless.

Certain castings, ornamental, etc., subject to low stresses, do not warrant this type of inspection. Air craft, auto and other parts subject to high stresses in service warrant x-ray examination during the development of the casting technique.

This is the forty-fifth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The forty-sixth installment will appear in an early issue.—The Editors.

Appointed Representative

James T. Castle, 424 First avenue, Pittsburgh, has been appointed district representative for western Pennsylvania, northern West Virginia, and the border counties of Ohio by Roots-Connersville-Wilbraham, Connersville, Ind., manufacturers of blowers, pumps, meters, etc. D. J. McConnell is associated with Mr. Castle.

Elected a Director

Franklin G. Smith, president of Osborn Mfg. Co., Cleveland, has been elected director of the Foundry Equipment Manufacturers association. This association has prepared and filed a code under the NIRA covering the manufacture and sale of foundry machinery and equipment.

Elasticity in Labor Conditions

(*Continued from Page* 25)

minimum wage levels. The only division which shows a possible decrease in the minimum rate of pay is the Pacific Coast division.

In this industry, the occupations are peculiar to the art of molding and casting molten steel. There is a small proportion of common labor and no one predominating class. The employes are composed of a large number of comparatively small groups of specialists. The standard cost sheets of the industry list about 40 separate labor occupations and some of these are subdivided further.

To reduce the permissible maximum hours of work per week further than those embodied in the code would produce a shortage of such skilled workers. We have already had reports and protests from several foundries who have anticipated the shorter work week and have reduced to 40 hours per week. Moreover, all other conditions being equal, the available workers will seek employment where they are permitted to work longer hours and thus earn more money and the foundries would, as a consequence, have great difficulty in filling their employment requirements. Certain processes and jobs require individual workers and to limit their hours further would, in many cases, produce excessive losses of material and labor.

The steel casting industry is desirous of co-operating with the NRA to the fullest extent and of giving employment to the greatest number of employes possible. However, there are many practical production factors that must be considered in trying to meet the employment problems and work out the production perplexities.

Will Absorb Many Men

Bookings of orders are increasing and if the efforts of NRA to restore purchasing power are only partly effective, we feel the hours embodied in our code will bring about the reabsorption of all available employes normally attached to our industry by the time the industry has reached three-fourths of its normal operating rate or when it is working at about 50 per cent of capacity.

A survey of labor rates and hours of labor shows that in the year 1926, which is considered a normal year, the industry operated at 68 per cent of capacity. In 1926, the average hours worked per employe per week was 50.4 and 9 hours per day. This figure is slightly higher than the 49.5 hours per week worked by the iron and steel industry for the average period of 1929 and 1930, which they consider about the same as the year 1927. That year, from a production standpoint, was for all practical purposes the same as 1926 for that industry, as there was only a difference of 3.7 per cent in the total production for the 2 years. Surely, it would not be fair to impose fewer hours on an industry so closely allied to the iron and steel industry.

On the basis of *normal* production and the 40-hour week, the industry would require an average total of 54,209 employes. In the normal year 1926, the industry employed an estimated average of 43,023 men. So, if the industry were to reach a 68 per cent operating ratio, it would require an average surplus of 11,186 men which, due to the wide distribution of steel foundries, would work a hardship on many members of the industry due to their inability to obtain locally skilled steel foundry workers—not just men. It might even create an impossible situation.

At present, the individuals on the industry payrolls total approximately 25,150 men. This indicates a possible labor supply of steel foundry workers of 17,873 to be absorbed by the industry. On the basis of three-quarters of normal operation, this supply would be absorbed, the industry working now at 30 per cent of normal and 20 per cent of capacity. We are now employing about 5000 more employes than the production of orders require, as the average number of employes working per week compared to actual names on payrolls differ by that number.

As a matter of record, since 1926, 55 foundries have closed. These foundries represented 24,141 tons of productive capacity and 8437 employes. It is quite probable that many of these plants will never reopen. The employes have already or will have to find work in other industries. Therefore, the apparent surplus should be decreased by at least a portion of this amount until demand for steel castings increases above normal. Some of these employes undoubtedly have been absorbed by the few new foundries that have been established during that period.

Relatively few new steel foundries have been organized since 1926 and the number of employes of these new companies would constitute only a small proportion of the number which were attached to the 55 foundries that have closed down or permanently discontinued their operations.

Foundries Need Orders

What the steel casting industry needs is orders for its products. Due to its jobbing nature and because it manufactures capital goods, few plants operate on a like basis. Operating reports from the individual members show that some are working almost to capacity while some are closed. Orders vary widely from day to day and week to week. Demands for steel castings are not uniform in any one plant or district or from any one customer or group of customers.

Dealing broadly with the question of labor supply and unemployment in the industry does not solve the problem of permissible hours as some districts have an over-supply of skilled foundry workers while others have an insufficient supply.

There is no way that the industry can suggest whereby labor can be transferred from one district to another, because labor shortages would be intermittent and would exist for only relatively short periods of time, or during peak demands.

A considerable portion of the production of steel castings constitutes repair parts or replacements. Quick deliveries are frequently essential to preserve continuity of operation or shorten periods of shut-down of companies purchasing these castings. Peak demands of this sort would challenge seriously the ability of the foundries to make immediate deliveries if permissible maximum working hours of employes were circumscribed by stipulating fewer hours than those set forth in the code.

Moreover reduction of hours below those specified would increase production costs to a point that would cause serious losses of business to competitive industries permitted greater latitude as to maximum working hours than the steel casting industry.

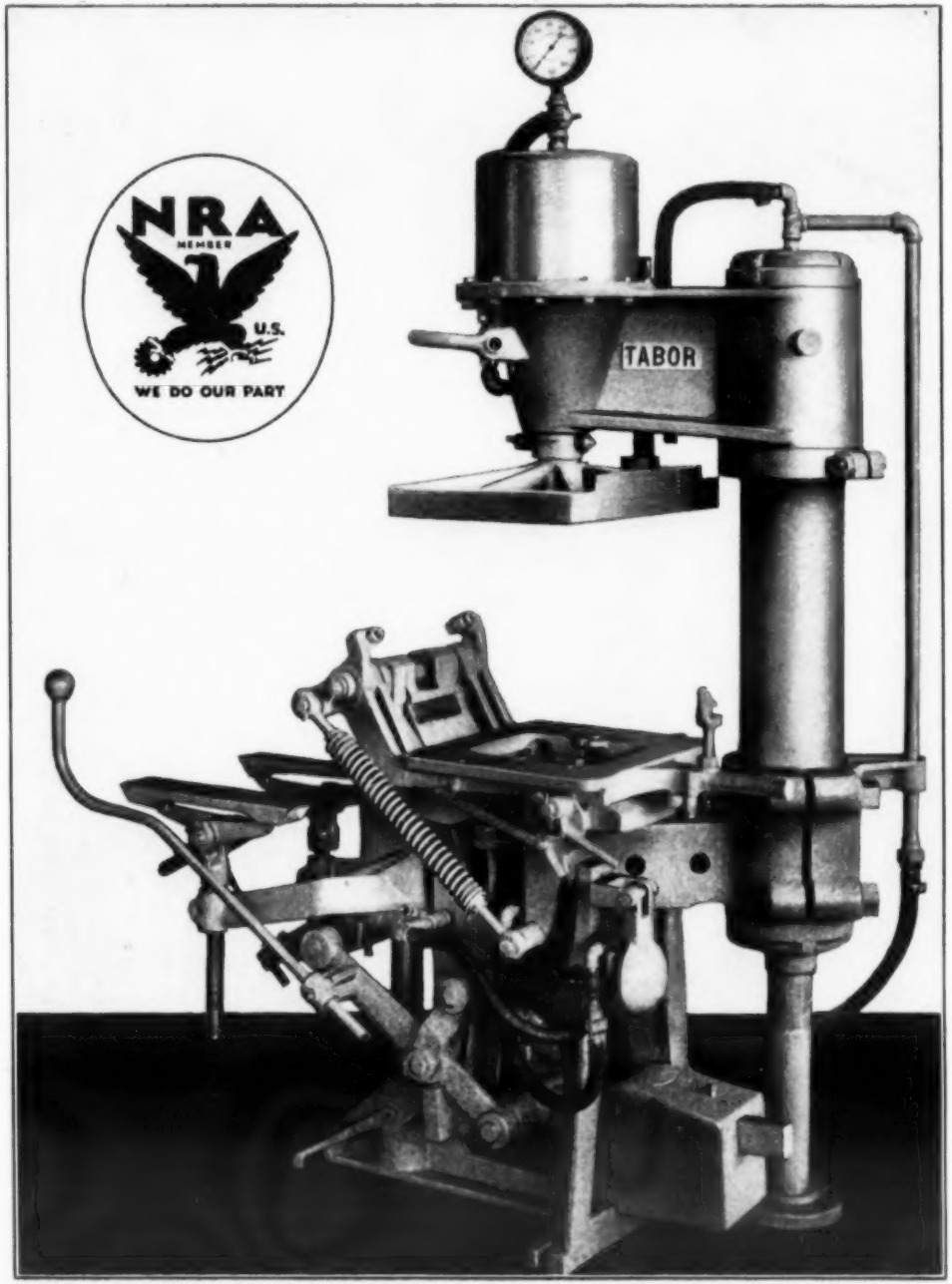
It follows, therefore, that there must be some leeway allowed the industry in the permissible maximum hours of labor per week other than those figured on a broad average of the general employment condition for the en-

(*Concluded on Page* 40)

For 31 Years

WHEN the formal hearing on the code of fair competition of the steel casting industry was held in Washington on Sept. 7, F. A. Lorenz Jr., on behalf of the board of directors of the Steel Founders' Society of America, presented a statement covering certain important conditions in the industry. This article represents that part of the presentation dealing with conditions of the industry as related to the provisions of the code on hours of labor.

Mr. Lorenz also pointed out that the Steel Founder's society was founded in 1902 and has functioned continuously since that time. The society's membership comprises 117 companies whose aggregate monthly capacity is 114,943 tons or about 80 per cent of the total active capacity of the industry.



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(*Concluded from Page* 38)

tire industry scattered from coast to coast and from Canada to the Gulf of Mexico.

Conditions, varying as they do in this widely scattered industry, are such that it is our opinion it might very well prove impossible to give employment to every steel foundry worker no matter what the hours of work might be.

Therefore, in summing up my remarks on the conditions of the industry and the reasons for requesting the provisions of permissible maximum working hours, it is firmly the opinion of the steel castings industry that:

To further reduce the permissible maximum hours of work below those specified in the Steel Castings code would produce limitations on the industry and would require them to absorb men from other industries at three-quarters *normal* operations. Further, it would place undue limitations on operating hours, which would make it impossible to meet the widely fluctuating demands of its customers.

Other Pertinent Features

There are other pertinent features of the industry worth mentioning. Steel castings are in competition with forgings, pressed steel parts, welded products, malleable and gray iron, stampings, aluminum castings and nonferrous metals—and these products are encroaching upon the market.

The money invested in the industry, the total volume of sales and the number employed constitute a real factor in the industrial life of the country.

The code, as presented, represents a cross-section of the views of the individual members, even though they represent widely differing conditions as to rate of operation, class of work, location and geographical labor conditions—not to mention individuals with widely divergent ideas—and it does represent a compromise of all of these ideas of how the steel casting industry may best operate under the NRA to achieve its purposes.

Directory Lists Alloys Used in Machines

The third edition of the "Directory of Iron, Steel and Nonferrous Alloys Used in the Design of Machines" recently has been published by *Machine Design*, Penton building, Cleveland. Alloys are listed alphabetically by trade name and information is presented on chemical composition and properties. The directory may be purchased through THE FOUNDRY for 25 cents.

Kroeschell Engineering Co., 2306 North Knox avenue, Chicago, has been appointed representative for refrigeration equipment of the Worthington Pump & Machinery Corp. in the Chicago district.

Lincoln Is Made Assistant Sales Manager

R. F. Lincoln recently was appointed assistant sales manager of the molding machine division, Osborn Mfg. Co., Cleveland, according to announcement of M. W. Zeman, sales manager. Mr. Lincoln joined that organization a little over ten years ago, shortly after leaving the air service.

Born at Quincy, Mass. in 1891,

R. F. Lincoln

Mr. Lincoln was educated in the public schools of Cleveland, and entered the employ of the Winchester Repeating Arms Co., New Haven, Conn., where he spent 12 years, thus gaining a knowledge of that subject which enabled him to serve as an expert in the handling of arms and ammunition in connection with aircraft armament.

In entering the foundry field, he immediately became a student of Prof. H. M. Boylston, Case School of Applied Science and completed the special course in metallography and the metallurgy of iron and steel given by Prof. Boylston at Cleveland college.

Approves Code For Soil Pipe Industry

The cast iron soil pipe code of fair competition, which was sponsored by 90 per cent of the industry, has been approved by the President. According to a statement of the Administrator, 60 per cent of the tonnage of the industry is in Southern plants, and 40 per cent in the North.

Bureau of standards recently has published research paper RP572 "Creep and Structural Stability of Nickel-Chromium-Iron alloys at 1600 Degrees Fahr." by W. A. Tucker and S. E. Sinclair. The publication may be obtained from the superintendent of documents, Washington, for 5 cents.

Acquires Line of Air Handling Devices

Johnson Corp., Three Rivers, Mich., has acquired the line of Gast air separators, aftercoolers, oil absorbers, etc., from the Smith-Monroe Co., South Bend, Ind. L. D. Goff, for several years sales and factory manager of the Armstrong Machine Works, Three Rivers, is president of the Johnson Corp., and R. O. Monroe has become associated with the organization as manager of sales.

The firm also manufactures rotary pressure joints and will introduce other steam and air devices in the future.

Manual Outlines Method of Presentation

American Society for Testing Materials, 1315 Spruce street, Philadelphia, has published the "A. S. T. M. Manual on Presentation Data", which was prepared by a special committee of the society. The manual discusses the application of statistical methods to the problems of condensing information obtained in a set of observations and condensing information in a concise form more readily interpretable than the unorganized mass of original data. Copies may be secured from the society for 50 cents.

Book Review

The Technical Man Sells His Services, by Edward Hurst, cloth, 239 pages, 5½ x 8, published by the McGraw Hill Book Co., and supplied by THE FOUNDRY, Cleveland, for $2 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This volume should be of considerable interest to technically trained college graduates since it presents information developed to assist in the securing of jobs. The work may be applied to the young graduate just out of college, or to the technically trained man with some years of experience who finds it necessary to again sell his services. The author has used notes provided by 18 years of experience in helping to secure jobs for engineers as a basis for definite suggestions as to the best methods to employ.

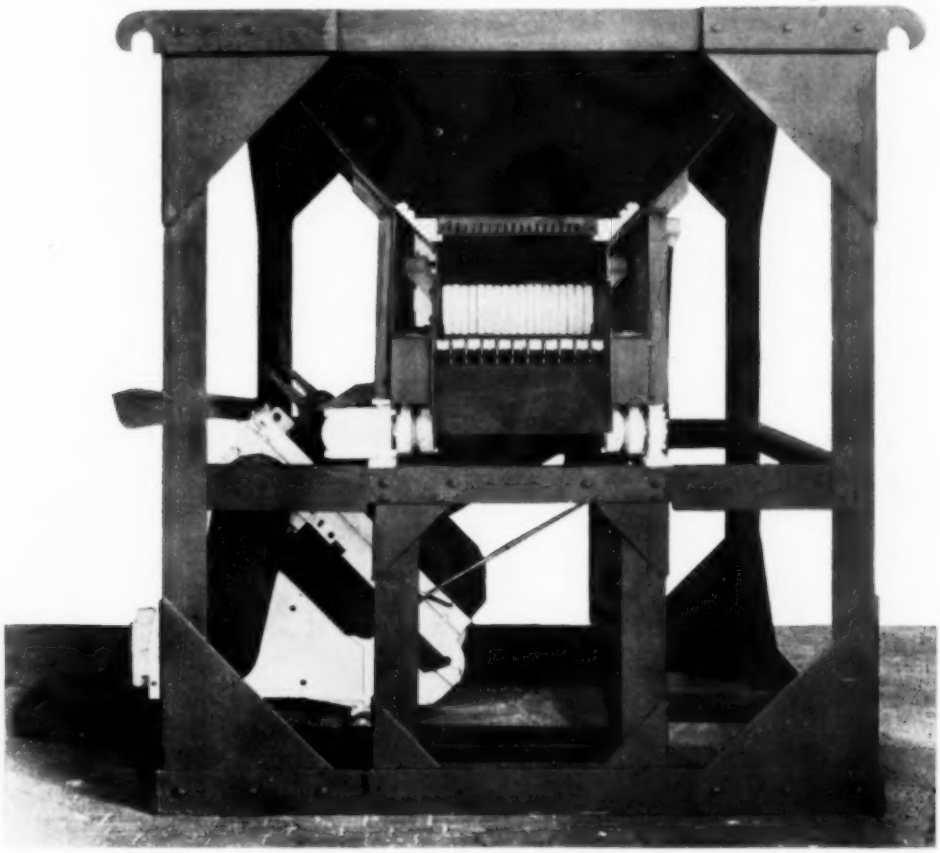
The text discusses the preliminary survey that must be made, methods of contacting the employer prospect, the technique of the interview, etc. Interviews of ten graduates of diversified technical courses are included, with the strategy of the applicant detailed.

The ROYER

combination of

Scrap Remover and Sand Separator & Blender

FOR TODAY'S FOUNDRY



In The Royer Combination of Scrap Remover and Sand Separator and Blender so many advantageous features have been incorporated; as to make this a most efficient and economical unit for the preparation of foundry sands.

For the large or small foundry, jobbing or continuous production in either ferrous or non-ferrous work this machine will assist in the preparation of backing sand or heap and facing sands, returning such substantial savings as to pay for itself in a very short time.

Being a portable unit no pits or foundations are required, the machine being carried to the sand instead of carrying the sand a long distance to the machine, and when not in use may be set to one side, thus conserving valuable floor space.

Let our engineers give you full details as to just how The Royer Combination will save you money.

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DAYTON, OHIO—Fenton Foundry Supply Co.
LOS ANGELES, CALIF.—Snyder Foundry Supply Co.
SEATTLE, WASH.—Western Foundry Sand Co.

Distributed in Canada by Canadian Foundry Supplies & Equipment, Ltd., Montreal, Que. and Toronto, Ont.

Mold Gear Wheels on Machine

(*Concluded from Page* 12)

the foundry. The machine can be set for practically any combination within its overall limits.

Most of the flasks are double flanged, but where the face of the wheel is not wide enough for a double flange flask, a heavy ring as shown in Fig. 1 is employed. Either form of construction insures the rigidity necessary to resist distortional strain. Several methods are available for carrying the sand in the cheek. In the majority of instances a flat ring extending in almost to the teeth is attached to the bottom of the cheek. In other instances the sand is supported on a *sand strip*, a thin, internal flange at the bottom of the cheek. Where the overhang exceeds 4 inches, a row of light gaggers is set against the wall of the cheek. In extreme instances it may become necessary to use a light ring arbor or crab suspended by hooks, bolts, or wires on the inside of the cheek. A long nail is set at an angle in the point of each sand tooth at the bottom and also at the top. The size and length of the nail will depend on the shape and depth of the tooth. Nails with small heads, known as *finishing* nails, are best for this purpose. Where nails with large flat heads are employed, especially on the bottom, the small triangular pieces of sand forming the points of the teeth are likely to fall off.

Where a cheek of the proper depth and diameter is available, the mold usually is constructed as shown in Fig. 1, with individual parts for the drag, cheek and cope. Under other conditions, the mold is constructed as shown in Fig. 2 with the cheek and drag forming one unit, the arms and hub formed in a set of green sand cores, and a flat cope.

Presents Automotive Methods

In the first instance a half pattern of the hub and arms is mounted on a board or plate inside a ring corresponding to the rim of the wheel as shown in Fig. 5. Since the pattern is symmetrical, either cope or drag may be rammed on this device. Suitable pin holes in the flask flanges, and accurate mounting of the pattern on center lines, insure accurate coincidence of the cope, drag and cheek when the mold is assembled. With this type of equipment the mold may be rammed by hand, on a jolt ram machine or under a sandslinging machine. Both copes and drags are barred and no bottom plate is required.

In the second instance the drag is centered joint side up on the gear molding machine, rammed full of sand and struck off flush. The tooth making device then is adjusted and the ring of teeth is formed. After each tooth is formed a flat piece of wood with a suitable profile is laid on the sand to hold it in place. It is held down with one hand while with the other hand, the molder turns the hand wheel which raises the tooth block pattern. The indexing mechanism revolves the flask a distance equivalent to the distance between two teeth and the tooth block is lowered again into place. This is repeated until the entire circle is complete.

The mold then is lifted from the machine and placed on the floor in readiness for the cores. The cope flask is placed joint side down on the table of the machine and rammed full of sand. It may just as readily be rammed on a jolt machine. In an emergency any flat board or plate may be utilized as a foundation on which to ram the cope. If part of the hub or even the core print is to appear in the cope, then manifestly the cope must be adjusted on the ramming face in such a manner that the hub or core print will appear in the center.

Arm Held in Center of Box

The inside of the mold, that is the part enclosing the arms and hub, is formed in a set of green sand cores, one core for each arm. Method of forming the core is indicated in Fig. 6, showing top and sectional views of a corebox with a loose end and with a segment of the hub attached in the apex. The pattern for the arm is slightly tapered and is held in place in the center of the corebox by dowel pins in the stumps fastened respectively to the hub section and to the center of the end of the corebox.

A cast iron arbor, known also as a grid, or a crab, and provided with four steel lifting loops, is placed in the bottom of the core box. Small cores need no further reinforcement, but the sand in large cores is strengthened by the incorporation of long rods laid transversely and longitudinally on every course of sand. Some foundrymen favor the use of arbors with long vertical dabbers or prickers. Under exceptional conditions it may be necessary to place a second arbor, or a plate in the upper part of the core above the arm, to resist the pressure of the metal when the mold is filled.

After the core has been rammed and struck off flush, the catches on the corebox are released and the sides and end are removed from the core. The arm pattern then is drawn horizontally. A coating of plumbago is applied to all parts of the core exposed to the metal and then the core is picked up by the four loops and lowered into its place in the mold. The hub impression serves as a guide in the center and two small thickness sticks on the outside guide the block into its proper position in relation to the teeth.

Revise Scope of Gray Iron Organization

In response to conditions developed in the preparation of a code for the gray iron foundry industry, a complete change in by-laws of the Gray Iron institute has been effected and the name of that organization embracing its new form of organization and activities, has been changed to the Gray Iron Founders' Society Inc., according to announcement by A. E. Hageboeck, Frank Foundries Corp., Moline, Ill., president of the society. The offices of the Gray Iron Founders' society are located at 4300 Euclid avenue, Cleveland.

Suggests Changes In Malleable Practice

Department of engineering research, University of Michigan, Ann Arbor, Mich., recently published a bulletin entitled "The Malleabilization of White Cast Iron" which was prepared by R. Schneidewind and A. E. White. The bulletin gives a summary on the subject of malleable iron and describes the experimental work carried out to determine the changes occurring during the course of transformation of white iron to malleable iron.

Individual factors which affect the rate of malleablizing are investigated, including temperature of annealing, silicon and carbon contents, atmosphere within the annealing furnace, and temperature of superheat of the molten iron. It is shown that any factor which reduces the time for graphitization accomplishes that end largely through its effect on the graphite distribution.

A new theory of malleabilization is proposed which attempts briefly to formulate some of the laws of graphitization mathematically and to explain the apparently unusual behavior of some irons. As a result of the investigation it is suggested that the silicon range be raised from 1 per cent to 1.5 or even 2 per cent; that controlled atmosphere must be used in annealing; and that higher superheating temperatures should be adopted in melting the irons.

John H. Clough recently was elected president of the General Electric X-Ray Corp., Chicago, succeeding C. F. Samms, who became chairman of the board.

ADVERTISING PAGES REMOVED

Leaded Bronze Affected by Alloys

(*Concluded from Page* 21)

were then put back into their respective pots and brought up to 2300 degrees Fahr., 0.05 per cent aluminum was added to one and the metal cast at 2300 degrees Fahr. (No. 31). The other mold was cast at 1900 degrees (No. 32).

Casting No. 31 showed no sign of silvery white on the surface, and no sign of shrinkage in the casting itself. The fracture was unsatisfactory, showing in color from dull red to dull brown. Large areas of dendrites ⅛ inch long loosely held together were evident to the naked eye.

Casting No. 32 showed no sign of silvery-white appearance on the surface, and no strain fins. The fracture showed several shrinkage holes with a smooth golden-colored surface. The longitudinal fracture contained a bad area in the center where the color was golden to reddish brown, with distinct shrinkage separation to a length of about 2 inches.

Showed Dead-White Surface

The metal remaining in the pot was brought to 2300 degrees Fahr. and 0.05 per cent silicon added in the form of 10 per cent silicon-copper. The first mold was cast at 2200 degrees Fahr. (No. 33) and the second at 1900 degrees Fahr. (No. 34)

Casting No. 33 showed a dead-white surface on the length of the gate all around, and the casting had a good many strain fins but no worm-like corrosion. The fracture showed considerable intercrystaline shrinkage and a tendency to separation for a length of about 2 inches. There was a dark orange spot along the center line of the casting. The usual chilled border was in evidence with dendritic crystals running at right angles to the fracture from the chilled area toward the top of the casting for about ½ inch.

Only one fracture showed the foregoing, the remaining pieces giving no evidence of such columnar dendritic structure. The fracture in general was of light yellowish color, with fine gas holes and one or two large shrinkage holes.

Casting No. 34 showed the characteristic white appearance on the surface, with very heavy worm-like corrosion especially in two or three large areas. There were no strain fins and no general shrinkage in the casting itself. The fracture of two pieces was quite normal, but one piece showed a fracture having a segregated area of light yellow crystals in the center. There was no sign of actual separation.

To sum up, the addition of 0.05 per cent phosphorus to metal used for engine drivers gave no evidence of trouble as to surface appearance or fracture when cast at high or low temperatures, although the lower temperature did have a closer fracture, as would be expected. However, at the high temperature, the metal did not eat into the sand, although here were a few strain fins.

Addition of 0.05 per cent silicon to the same metal gave evidence of serious defects at both high and low temperatures.

Addition of 0.05 per cent aluminum gave no evidence of its presence on the surface of the casting but showed clearly in the fracture, giving serious dendritic structure at the high temperature and still more internal shrinkage separation at the low temperature.

Test Leaded Bronze

EXPERIMENTS were run on scrap metal and virgin metal mixtures to determine the effects of small quantities of phosphorus, aluminum and silicon on the fracture and outward appearance of leaded bronze castings. The scrap mixtures were poured into journal bearings and the virgin metal into locomotive driving brasses. Various pouring temperatures and percentages of additions were tried. Conditions of the resulting castings were compared. Test data convinced the investigators that aluminum and silicon must be kept out of the mixtures. Abstracted from a paper presented at the recent Chicago convention of the American Foundrymen's association. The author is lecturer, department of metallurgy, McGill university, Montreal.

Discusses Test Methods for Cast Iron

During the international foundry congress held in Prague, a meeting of the International committee on testing cast-iron was held on Sept. 10. In the absence of Professor Portevin, president of the committee, Professor Pisek, president of the Czech foundry association, took the chair. Guido Vanzetti acted as secretary.

The following countries were represented at the meeting: Belgium, represented by J. Leonard, president of the Belgian association; Czechoslovakia, by Professor Pisek; France, by Mr. Bizet and Mr. Chaintreuil; Germany, by Mr. Meyersburg and Mr. Mehrtens; Great Britain, by J. G. Pearce and Tom Makemson; Holland, by Mr. Maas Geesteranus; Italy, by Guido Vanzetti; Poland, by M. K. Gierdziejewski; Spain, by M. Navarro Alcacer, and the United States, by Vincent Delport.

After discussing reports received by various associations, it was agreed that there were still many points concerning which unanimity was lacking, and that a good purpose would be served by establishing a program of work for the coming year, to investigate one or two problems, to find out if a measure of agreement could be reached.

It was then decided that a series of tests should be carried out for tensile strength, to find out causes of differences now existing in various countries in results obtained in the tensile test.

A subcommittee was formed, including Dr. Meyerburg, of Germany, J. G. Pearce, of Great Britain, Professor Pisek, of Czechoslovakia, J. Leonard, of Belgium. It was agreed that a series of uniform test bars should be made under the care of J. Leonard, and distributed among the four countries mentioned above. In each country a series of tests will be effected, and the results will be sent to the committee, with a report covering in detail the conditions under which the tests were conducted.

A resolution was passed to that effect, with a proviso from the French delegates that they maintained the position of France with respect to the greater interest which, they claim, exists in regard to the shearing test, and, therefore, they will pursue their investigations in that direction.

It was also agreed that each country should be invited to send to the secretary of the committee copies of any specifications existing in the respective countries as well as the results of any work in connection with the tensile test. This data will be collected with a view to constituting a complete set of references.

Acquires Company

Jeffrey Mfg. Co., Columbus, O., recently acquired the manufacturing and selling rights for all equipment formerly manufactured by the Traylor Vibrator Co., Denver. The Denver plant of the Traylor company has been closed and the business will be conducted as the Jeffrey-Traylor division of the Jeffrey Mfg. Co. in Columbus.

James A. Flint, formerly vice president, Traylor Vibrator Co., will be in charge of the new division. Robert W. Gillespie is president of the Jeffrey Mfg. Co.

Leo I. Smith, 45 Gorham Road, Belmont, Mass., has been appointed district representative in the New England territory by Roots-Connersville-Wilbraham, Connersville, Ind.

Malleable Iron Code

(*Continued from page* 15)

shall have theretofore mailed a copy of such schedules to such member.

SEC. 3. All amounts so paid to or collected by the treasurer under this Article IX or under Article VI of the code shall be held and disposed of by him as part of the funds collected under the code and each member of the society not guilty of the unfair practice in respect of which any such amount shall have been paid or collected shall be credited with its pro rata share of such amount on account of any and all assessments due or to become due from such member under the code, such pro rata share to be computed on the same basis as the last previous assessment made against such member on account of the expenses of administering the code. All rights of any person who shall at any time be the treasurer in respect to such amounts which shall be payable to him as an individual as in the code provided, shall pass to and become vested in his successor in office upon appointment of such successor.

SEC. 4. Each member of the society by becoming such member agrees with every other member thereof that the code constitutes a valid and binding contract by and among all members and that, in addition to all penalties and liabilities imposed by the statute, any violation of any provision of the code by any member thereof shall constitute a breach of such contract and shall subject the member guilty of such violation to liability for liquidated damages pursuant to the provisions of the code. Each member of the society by becoming such member thereby assigns, transfers, and sets over to the treasurer as an individual and not as treasurer of the society, in trust, all rights and causes of action whatsoever which shall thereafter accrue to such member under the code for such liquidated damages by reason of any violation of the code by any other member thereof, and thereby designates and appoints the treasurer as such individual the true and lawful attorney-in-fact of such member to demand, sue for, collect, and receipt for any and all such right or cause of action, and to compromise, settle, satisfy, and discharge any such right or cause of action, all in the name of such member or in the name of the treasurer individually, as he shall elect.

SEC. 5. The board of directors by the affirmative vote of two-thirds of the whole board may waive any liability for liquidated damages herein provided for if it shall decide that the collection of such damages will not to any material extent tend to effectuate the policy of Title I of the National Industrial Recovery act.

Article X—General Provisions

SEC. 1. Any notice, demand, or request required or permitted to be given to or made upon any member of the industry shall be sufficiently given if mailed, postage prepaid, addressed to such member at the address of such member on file with the secretary of the society; provided, however, that any member of the industry may waive, in writing, the making or giving of any such notice, demand, or request.

SEC. 2. Except as otherwise specifically provided herein the provisions of the code shall apply and be binding upon every member of the industry, whether or not such member shall be a member of the society. No member of the industry which shall not also be a member of the society shall be entitled to vote at any meeting of members of the society or to any other right, power, or privilege provided in the code for the members of the society.

SEC. 3. The board of directors shall have power to interpret the provisions of the code, provided that nothing herein shall be construed to limit the rights of any member of the industry or other person or entity to appeal to the Administrator to modify or rescind any interpretation of the board of directors.

SEC. 4. The code and the provisions thereof are expressly made subject to the right of the President, in accordance with the provisions of subsection (b) of section 10 of the National Industrial Recovery act, from time to time to cancel or modify any order, approval, license, rule, or regulation issued under Title I of said act and specifically, but without limitation, to the right of the President to cancel or modify his approval of the code or any conditions imposed by him upon his approval thereof.

SEC. 5. Any action taken by the board of directors for the purpose of making effective the provisions of the code may in the discretion of the board of directors be submitted to the Administrator for approval, and shall in any case be subject to the disapproval of the Administrator.

Article XI—Amendments

The code may be amended at any time in the manner in this article provided. The changing of any schedule hereof or addition hereto of any new schedule shall constitute an amendment of the code. The amendments shall be proposed by the board of directors by vote of the majority of the members thereof at the time in office, which amendments shall be submitted to a duly called meeting of the members of the society. If at such meeting, two-thirds of the voting power of the society, without regard to number present, shall vote in favor of the adoption of such amendment, such amendment shall be submitted by the board of directors to the President for approval if approval thereof by him shall be then required by law. Every such amendment shall take effect as part of the code upon the adoption thereof by the members of the society as above provided and the approval thereof by the President if approval by him shall be required as aforesaid. Any member of the industry may recommend amendments of the code to the board of directors or to the Administrator.

Upon termination of the code all obligations and liabilities under the code shall cease except for unpaid assessments theretofore made in accordance with the provisions of the code and those for liquidated damages theretofore accrued under the provision of the code.

Schedule B—Unfair Trade Practices

For all purposes of the code, the following described acts shall constitute unfair practices:

1. Selling castings other than f.o.b. the plant of the member of the industry; provided, however, that railroad freight, or trucking charges may be allowed to destination, at the option of the seller, and provided further that no allowance exceeding the prevailing carrying charges may be made where the buyer elects to call at the plant of the member for castings.

2. Allowing terms of payment more favorable to the purchaser than net 30 days from date of shipment or beyond the last day of the month following shipment, or granting any cash discount greater than one-half of one per cent for payment made within 10 days from date of shipment.

3. Making piece prices based on stated weights without a revision of the price on any variation between the stated weight and the actual weight.

4. Making, altering, or repairing pattern equipment (when repairs are not due to negligence of the member of the industry) except at the expense of the customer; provided, however, that if patterns in existence at the effective date of the code are owned by members of the industry and such members of the industry furnish castings from such patterns without an adequate pattern charge, other members of the industry may have the right to also furnish such patterns at their own cost; and provided further, that if castings are made by a member of the industry for the general trade as distinguished from a specific customer the patterns from which such castings are furnished may be made by such member at his own expense.

5. Making or promising to any purchaser or prospective purchaser of malleable iron castings which require special finishing, straightening, machining, or other operations not commonly included in the manufacture of a commercial casting without making a charge for the cost of the dies, jigs, tools, or other special equipment used in such operations; provided, however, that if said special equipment in existence at the effective date of the code is owned by members of the industry and such members of the industry furnish castings from such special equipment without an adequate charge, other members of the industry may have the right to also furnish such special equipment at their own cost.

6. Extending to purchasers without charge special privileges, concessions, or services not extending to all buyers under like terms and conditions, or rendering any free service of machining, painting, galvanizing, or tinting not customary in the industry.

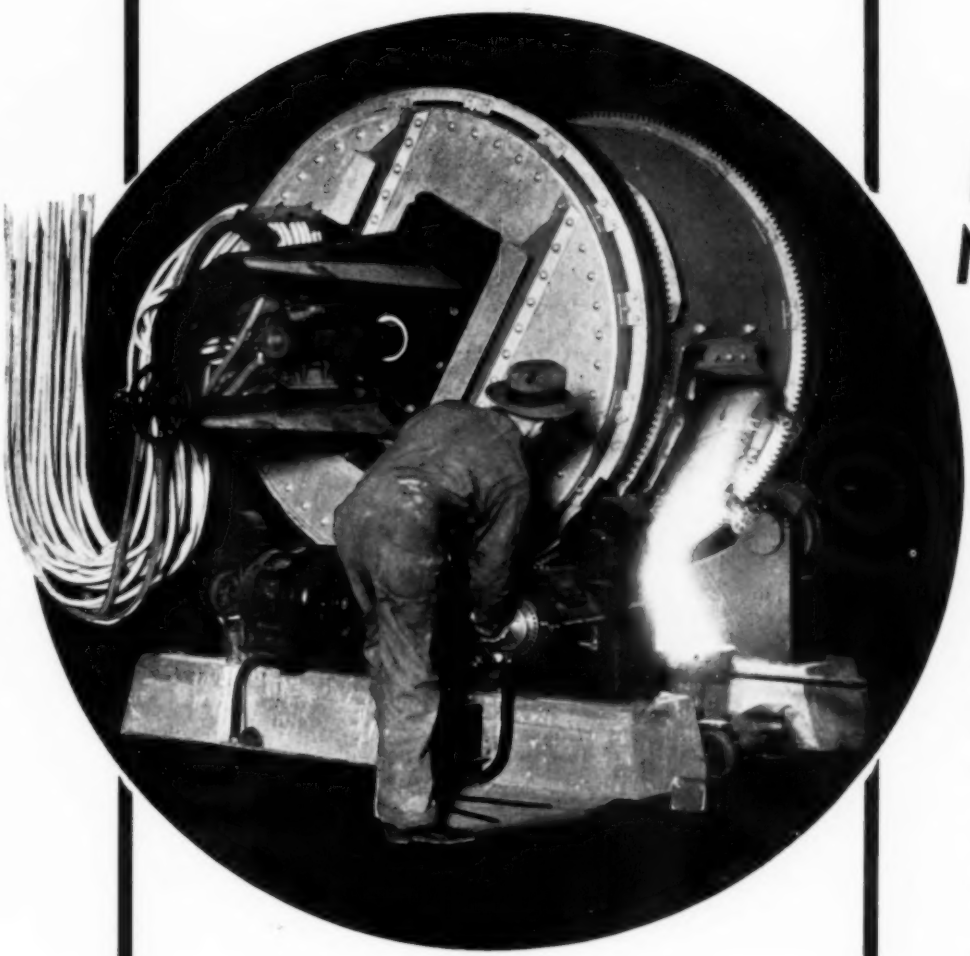
7. Making or promising to any purchaser or prospective purchaser of any product, or to any officer, employe, agent, or representative of any such purchaser or prospective purchaser, any bribe, gratuity, gift, or other payment or remuneration, directly or indirectly, for the purpose of influencing a sale.

8. Procuring, otherwise than with the consent of any members of the industry, any information concerning the business of such member which is properly regarded by it as a trade secret or confidential within its organization, other than information relating to a violation of any provision of the code.

9. Imitating or simulating any design, style, mark, or brand used by any other member of the industry.

(*Concluded on page* 48)

PROVEN! —ACCEPTED!



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which has shown an outstanding adaptability in the economical production of high quality iron with a precision which is invaluable to the industry. The rocking action inherently effects high thermal economy and low maintenance cost. These fully established facts have been repeatedly demonstrated by Detroit Rocking Electric Furnaces used in widely diversified production requirements.

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Detroit Rocking Electric Furnaces assist in improving working conditions. The control of pouring is precise. When melting alloy iron and steels the saving of alloys in Detroit Rocking Electric Furnaces as compared with other melting mediums is an outstanding feature.

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DETROIT ROCKING ELECTRIC FURNACES

(*Concluded from Page* 46)

10. Paying or allowing to a purchaser in connection with the sale of any product a secret or discriminatory rebate, commission, credit, discount, adjustment, or other concession.

11. Canceling, in whole or in part, any contract for the sale of a product except for a fair consideration, or effecting an adjustment of the claim of any purchaser in such a manner as to result in a secret or discriminatory allowance or concession.

12. Disseminating, publishing, or circulating any false or misleading information relative to any product or price for any product of any member of the industry, or the credit standing or ability of any member thereof to perform any work or manufacture or produce any product, or to the conditions of employment among the employes of any member thereof.

13. Inducing or attempting to induce by any means any party to a contract with a member of the industry to violate such contract.

14. Making or giving to any purchaser of any product any guaranty or protection in any form against decline in the market price of such product.

15. Stating in the invoice of any product as the date thereof a date later than the date of shipment of such product, or including in any invoice any product shipped on a date earlier than the date of such invoice.

16. Purchasing from customers goods and/or services at prices higher than the market for such goods and/or services, for the purpose of influencing or inducing the purchase of malleable castings.

17. Absorbing all or any part of the machining cost of castings sold as machined castings.

18. Making any payment or allowing any credit or back charges for machine work, labor charges, or other expense incurred by the purchaser on castings rejected as defective.

19. The giving of quantity discounts without obligation on the part of the buyer to take delivery of the quantities specified in the contract.

20. Enticing employes of a competitor with the purpose and effect of unduly hampering, injuring, or embarrassing said competitor.

21. Any misrepresentation in connection with the sale or advertisement for sale and/or marking of any malleable castings with the intent or effect of misleading or deceiving purchasers or prospective purchasers regarding their quality, composition, or service features.

Steel Casting Specifications Approved

Consolidated specifications for carbon-steel castings for industrial, railroad and marine uses recently were approved for publication as tentative by the American Society for Testing Materials on the recommendation of its committee A-1 on steel. Specifications apply to carbon-steel castings for miscellaneous and jobbing purposes, for locomotive and car equipment, and for ship construction. Provision is made for two classes and five grades. Class A consists of one grade designated as special No. 1 for which no physical requirements are specified. Class B consists of four grades, regular, special No. 2, special No. 3 and special No. 4, for all of which physical requirements are specified.

The steel is to be made by one or more of the following processes: Open hearth, electric-furnace, converter, or crucible. Detailed requirements for heat treatment are included. The maximum carbon content of Class A castings is put at 0.45 per cent, with manganese 0.50 to 1.00 per cent; silicon, 0.20 to 0.75 per cent; maximum phosphorus, 0.05 per cent; maximum sulphur, 0.06 per cent. No carbon content is specified for class B castings inasmuch as physical requirements are given and the requirements for the other elements are the same as in the class A castings. The tensile requirements for class B castings are as follows:

	Grade of Class B Casting			
	Regular	Special No. 2	Special No. 3	Special No. 4
Tensile strength, lb. per sq. in....	70,000	60,000	60,000	80,000
Yield point, lb. per sq. in.	38,000	30,000	30,000	43,000
Elongation in 2 in. per cent.....	24	22	26	17
Reduction of area, per cent	36	30	38	25

The regular grade is the cast steel required for most miscellaneous structural purposes, for large tonnages of castings for railway rolling stock and for many castings for ships. This grade is readily machined. Special grades No. 2 and 3 are used mainly for large special castings for railway equipment. These grades are intended to have low carbon content making the material easily machineable either in the as-cast or in the annealed condition. Special grade No. 4 is used for purposes calling for higher strength and less required ductility than are typical of the regular grade. It is usually machineable without appreciable difficulty with modern machine tools.

The supplement for marine castings provides that all castings shall be of the regular grade class B. Coupons representing each of certain special castings must be tested in tension and in bending . Castings listed include stern frame, rudder, steering quadrant, propeller shaft bracket, tiller, etc. Requirements are included for bend and percussion tests.

The supplement for railroad castings requires that tension tests be made from bars attached to each locomotive frame, locomotive cylinder, wheel center, etc.

The actual promulgation of the consolidated specifications was in charge of a committee headed by R. A. Bull, consultant on steel castings, Chicago. Copies of the specifications can be obtained from A. S. T. M. headquarters, 1315 Spruce street, Philadelphia.

Committee E-10 on standards which acted for the society in approving the carbon-steel castings specifications also approved for publication as tentative, methods of impact testing of metallic materials. These methods establish a standardized procedure for notched-bar impact tests used for the comparison of the brittleness of metals. They are based on the best present day practice and have been prepared following a questionnaire submitted to a large number of firms and laboratories interested in impact testing. A full discussion of the scope of the test and a detailed calibration method are given.

At its meeting committee E-10 also approved as tentative revisions in the methods of rockwell hardness testing of metallic materials. The revisions include modifications in the requirements for rockwell test procedure.

Submits Code for Sash Weight Industry

The sash weight industry recently has submitted a code of fair competition to RA establishing a work week of 40 hours, excepting foremen receiving more than $35 a week, and maintenance men in emergencies, when they are to be paid time and a third for overtime. The minimum wages, excepting for cleaners and watchmen, is 37½ cents in the section west of the Mississippi river and north of the Mason and Dixon line, and 35 cents in the section east of the Mississippi and south of the Mason and Dixon line.

Question Code Cost Basis

(*Concluded from Page* 32)

ting a common labor rate of 30 cents an hour in district No. 1 where such a rate was in effect on July 15, 1929. Mr. Haswell entered a demurrer, claiming that this discrimination would give certain foundries an advantage over others of 25 per cent in labor costs, without any offsetting advantages.

Deputy Administrator King indicated an objection to inclusion of the merit clause, although permiting it to be offered by Mr. Fauntleroy. Mr. King also indicated that references to limitation on new capacity and representation of NRA on the board of directors of the society were not satisfactory.

A further amendment offered by the consumers' advisory board amplified the unfair trade practice reference to advertising, stressing that any advertising, direct or indirect, calculated to disparage a competitor's product represented an unfair practice.

W. R. Bean, Whiting Corp., Harvey, Ill., served as industry advisor and C. R. Wilkerson represented labor.

Type F Jar ramming Power Turn-over Power Draw Machines

We Build 61 Types of Machines for Molding Castings

We Build 14 Types of Machines for Making Cores

Type SB Core Blower

To insure MAXIMUM OUT-PUTS, MINIMUM MOLDING COSTS and LOWEST MAINTENANCE EXPENSE use - - - - - INTERNATIONALS

INTERNATIONAL MOLDING MACHINE CO.

2608-2624 W. 16th St. — **Chicago, Illinois**

All dressed up and no place to go

The Adventures of Bill

BY PAT DWYER

EXCEEDINGLY refreshing" I remarked to Bill the other night, "to have something turn up to break the regular routine of the day's operation. Something to blow away the mental cobwebs and lead one to realize—calamity howlers to the contrary—that all is not lost, that a few people still have their feet on the ground."

"Meanin' ?" Bill inquired suspiciously.

"Exactly, my dear lad. Meaning that I had a letter today from one of those boys blessed with the saving grace of humor. Just like a whiff of the east wind, the salt sea wind, stinging with brine, laden with spume, sweeping in over the headlands and dissapating the fog from valley and river bed and the smoke from the belching chimneys of industrial communities."

"I get you. You had a tarry missive from Sinbad the Sailor or one of his gang. What does he want you to do? Bail him out of jail, or advance him a trifling loan until the next time he sees you? Stinging with brine, hey? He'll sting you all right, all right."

"Old Willie the weasel, himself! Well, in this particular instance your highly developed hunting instinct is leading you on a false trail. The estimable citizen to whom I referred, the author of the mist dispelling, invigorating epistle of recent date conducts a foundry not 100 miles from where we are sitting at the present moment. And what—if I may adopt the vernacular for the moment—do you know about that, Willie?"

"Oh!" said Bill, "A foundryman? That's a different proposition altogether. To cope adequately with the many trying situations which arise, the foundryman rapidly acquires proficiency in the use of words and phrases stonily ignored by the late Mr. Webster and other dictionary compilers. Some of these words sting worse than brine, if you ask me. I knew a fella one time, a little half pint feller—"

"Some other time. This letter was not written by any of the men you have in mind. It was written in reply to a request for a photograph. The writer did not send the photograph, but the letter supplies an excellent mental image of many admirable and characteristic features."

For a period of almost two whole weeks—the American equivalent of a fortnight at normal rate of exchange—your letter of Aug. the 20 second—perhaps I had better write that Aug. 22—looks and sounds kind of silly, Aug. two two, like a locomotive whistle—Le's see, where was I?—Oh, yes! Your letter of recent date—Ha! that's better—Your letter of recent date has reposed on my table like one of these old time antimacassers or like the shew bread in the Sanctum Sanctorum.

I wonder had I better mention the fact that I also have a second table. Otherwise you might infer that I have only one table. What I really wish to convey is that your letter has been lying—you know what I mean, laying—on one of my tables since it—the letter you dope—arrived about two weeks ago.

According to my interpretation the letter in a general way deals with the subject of photography and then narrows down specifically to a request for a map, a likeness, a reproduction of a typographical view of the writer's facial landscape. Well, requests we always have with us, but coming across for these requests—Ah! That

This little pig went to market—later

is something from an entirely different strata.

Off hand and without the slightest hesitation or fatigue I could toss you 47 different reasons for declining to forward a photographic reproduction of the general features which no longer attract the attention of the man in the street, or even the attention of the owner when he sees them reflected in his boudoir mirror or in the shop windows of our better down town stores. However, in line with the new deal which like a new broom is sweeping the country, sweeping away extravagance, waste, and—I hope—enforced idleness—I shall not present you with the 47 different reasons. Under the new deal you get one—just one—no more, no less.

This one main reason which automatically sidetracks all the others and—you might say—renders them null and void is lack of preparation. I respectfully submit that I have not been given sufficient notice. You know very well that even in the case of a poor dumb brute, a horse, a cow or even a pig, he, she or it as the case may be, is well fattened and groomed before a picture is taken. I am rather indefinite as to my proper classification as a ruminant or a carnivora, but I think any further reference to photographs should be left in abeyance until proper remedial measures have been applied to remove the wrinkles, smooth down the fur, polish the nails, remove the burdocks, file the teeth, dock the mane and tail, drop a little belladonna in the eye, perk np the ears and invest a few pesos in some silver mounted trappings. Then bring on your photographer!

At the moment we are somewhat battle scarred from the economic thrusts and jabs of the recent campaign. We are weary and tired and our joints ache and creak like unto the never lubricated bearings on the old farm wind mill. The internal structure is not and probably never will be what it was in the days of our prime and lusty youth, but we pray you wait around a while until the exterior assumes a more pleasing appearance. In other words, brother, wait until we fatten up.

Behold, man goeth forth with good purpose, high hopes and ambition and lo, the very earth smiteth him from beneath and the shearer gathereth the fleece which was his'n. He maketh a bold stab and the cunning devices of the enemy dehorn him and he is sore smitten between the old oaken bucket and the door of the old red barn. Be-

twixt morning and evening they are destroyed. They perish forever without any regarding it. Is not their tent cord plucked up within them? Job IV, 20.

The gentle old patriarch Job was afflicted with boils and then more boils, scripture measure, full and running over. Lacking modern inventions, the rasp, the currycomb, the abrasive brick, the steel brush or even the lowly lump of coke "He took him a potsherd to scrape himself therewith, and he sat among the ashes." Job 11, 7.

Behold, we also have boils, mental, financial and economic, but where, Oh where abideth the comforting potsherd?

Like unto Balaam of old, wizards of finance, the captains of industry and the mighty, all recoil into lowly estate and posture.

Yea though we dwell in the land of perverted plenty, where the pomegranate waxeth bright on the hill side, where three point two floweth in torrents and cascades like unto the falls of Niagara; where the racketeer and the highjacker holdeth high carnival by the light of the moon and the kidnaper plieth his nefarious trade by day and night; lo, despite all these things I will fear no evil for there yet remaineth a few valiant men, willing to lay hold of the bull by the horns rather than by the tail which waveth in the breeze like unto the fronds of a pussy willow, or the white plume of Navarre, hell bent on destruction in the van of a stricken field.

"My regards to your friend when you write," Bill said. "He has a nice knack of juggling with words and fitting them into attractive patterns. I guess it is a kind of a gift bestowed on a comparatively small number of people. The letters I receive usually are plain, blunt and to the point with no attempt at verbal ornamentation. For example I had one from a man recently who said he was contemplating the production of a machine tool bed weighing about 1800 pounds. He was of the opinion that this casting should be made in a skin dried mold and as his experience in this line had been limited he would appreciate advice on materials and methods.

"Machine tool castings of much greater weight than 1800 pounds are produced quite satisfactorily in green sand molds where the sand is of a suitable character and where the molders are accustomed to the work. However, skin drying the mold imparts a perfectly clean smooth surface to the casting and eliminates many of the potential hazards, cuts, scabs, erosion and the generation of steam which may produce blowholes, sponginess and dirty areas on surfaces to be machined. Skin drying the face of the mold is a modified form of baking and produces a dry, hard surface against which the molten iron lies quietly. Also a thicker coating of blacking than is usual in green sand molding may be applied to the sand face since the moisture is all evaporated by the application of heat before the mold is closed. Furthermore a coarser grade of sand may be employed for facing since the heavy coat of blacking furnishes the necessary smooth surface. Coarse sand has a greater permeability than fine sand, therefore any steam or gas passes through it and away from the casting more readily.

Facing sand for a skin dried mold may be prepared by the addition of a comparatively small quantity of any dry or water soluble core binder. The object merely is to add a material which will bind the sand grains together when the natural or clay bond loses its *grip* under the application of heat. For example, flour in the proportion of 1 part flour to 12 parts sand will serve admirably. Any of the proprietary binders will serve equally satisfactorily. Of course the proportions will vary to some extent, depending principally on the character of the sand. The pattern is covered with the prepared facing material and the mold is made in the usual manner.

Several alternative methods may be employed in coating the face of the mold with blacking. In this instance the term blacking is used in the generic or foundry sense and includes any material with a carbon base. Plumbago, also known as silver lead usually is employed on skin dried molds. The principal reason for this probably is because plumbago may be applied either in the dry state or as a wash in which the material is mixed with water containing a little molasses or other water soluble binder—about 1 pint to a pail full of water. Where only a light skin drying effect is required—⅛ to ¼-inch—the plumbago is applied with a brush, or rubbed on by hand. The molder then goes over the entire surface with a brush dipped in a weak solution of molasses water.

Where a deeper penetration is required the blacking or plumbago is applied in liquid form either with a brush, a swab, or from the nozzle of a spray gun. This is a job for a skilled operator. In the hands of an unskilled or careless man an excessive amount of the material will be deposited in corners, pockets, etc., in the bottom of the mold. Not only will this excess material destroy the shape of the mold at these points, but it will resist almost every effort to dry it out. Under certain conditions the molder finds it advisable to cover certain parts in the bottom of the mold with paper or waste until after he has applied the wash to the vertical walls and other surfaces. The covering then is removed with the accumulated droppings and the molder applies the necessary amount of blacking to the exposed areas of the mold.

A little confidential stuff touching on Job, his boils and other crosses

Local conditions govern the methods and devices employed to dry the mold. Where gas or oil burners are available, they may be adapted readily to serve the purpose and probably constitute the cleanest and most convenient method. Torches operating on compressed air and oil are employed extensively in skin drying practice. In the hands of a skilled operator they are ideal for the purpose. Charcoal fires have been used in the foundry for many years. In some instances the fires are built on thin steel plates either submerged in the mold, or supported on the joint. Coke baskets are employed for the same purpose. Where the fire is built inside the mold the top of the mold is covered with thin plates to conserve the heat. In some instances it is feasible to lower the cope to a position a few inches above the drag and thus dry both cope and drag with the same fire. In some foundries where large molds are dried in the floor, the cope is closed down over the drag and a stream of hot air driven by a fan and through a coke fire is forced down through the runner or riser.

C. F. Cate, 610 North Twelfth street, Albuquerque, N. Mex., has been made representative in Arizona for the Whiting Corp., Harvey, Ill.

Producing Small Steel Castings

(*Continued from page* 23)

GREEN SAND FACING A

For light and thin section castings, for flat (horizontal) surfaces on heavier castings, and for gates.

	Per cent
New wash and dried sand fine,	40-60
Fines from reclaimer	60-40

Cereal binder, or both.
Plain Water.
Moisture, not over 3.5 per cent
Permeability, 70-100 per cent

GREEN SAND FACING B-1

For medium work, and vertical surfaces on heavier work.

	Per cent
Good sand	75-100
Fines	0-25

Cereal binder, clay binder, or both.
Plain water.
Moisture, not over 3.5 per cent
Permeability, 100-150.

GREEN SAND FACING B-2

This mixture is for same use as "B-1." To replace the waste from the reclaimer and keep enough sand in the shop, it is necessary to add some new, coarse sand. For this purpose a facing of the same physical characteristics as "B-1," but made mainly from new raw sand is used. Of course a certain amount of new sand can be added to the "B-1" facing to cut down the number of sands used, but it is thought best to introduce the new sand as in B-2, using this facing on less particular work.

BACKING SAND C

For all green sand work.

Good Sand ..... 100 per cent

Clay binder, when necessary.
Plain water.
Moisture 0.3-3.5 per cent
Permeability 175, minimum.

In most cases the *good* sand will carry sufficient bond when properly milled with water, but at times a small amount of clay may be required.

Facing *A* must be used sparingly, due to its low permeability and high cost. Cutting, scabbing etc., are more likely to occur on flat, horizontal surfaces than on vertical surfaces. Facing *A* should be riddled lightly over the pattern, enough to merely cover the flat surfaces, and then packed around the gate and near the gate. Vertical surfaces may be covered with *B*-1 or *B*-2. To make this covering as light as possible, some foundries use a sheet iron shell, roughly following the outline of the pattern, and allowing not over 1-inch of facing. After the backing sand has been put in the flask, the shell is withdrawn before ramming or while jolting. Nothing but *C* sand should be used for backing, as with the relatively close facings advocated, it is essential that the most open sand possible to use is supplied to allow free exit of the gases or steam.

A fine, dense and smooth mold face may be used safely if proper provision is made for an open backing sand, and the backing sand is not too far away from the pattern, or in other words, if the coating of impermeable facing is not too heavy.

This principle is demonstrated daily in dry sand practice, where an extremely impermeable mold face is obtained with silica wash, backed up by a sand made open by driving off most of the water. More steam is generated in pouring a green than a dry sand mold but sufficient gas and steam are present in dry sand work to cause trouble if it were not for the open backing sand. By holding the moisture content low, and backing sand permeability high, dry sand results can be duplicated in green sand, and still retain all the advantages of green sand practice.

Gas Must Escape

Wherever satisfactory castings are made with disregard for the quality of the backing sand used, it is accomplished only by extravagant use of a high quality facing. Enough must be used to provide open spaces between grains sufficient to permit escape steam and gases given off in pouring. Since it is used in a considerable quantity, more good sand is returned to the heap, making the backing sand more open; a costly way to get the desired permeability in the backing sand. This also is an uncertain method, as sooner or later the heap will close up due to the excessive amount of binder returned to it. If the molder does not get the facing on thick enough, an epidemic of pin-holes, scabs and burning-on will result. This practice eliminates the possibility of taking advantage of the smooth, clean surfaces imparted by the use of finer facings.

A number of casting defects ordinarily attributed to shrinkage often are caused by surface penetration of gases or steam into the casting. Rough depressions seen in the corner where a rib joins the wall of a casting, are termed *draws*. Usual practice is to place a chill nail or other form of chill in these corners. If such defects actually were shrinkage, we should expect a cavity at the center of the intersection, but if there is no cavity, it is reasonable to suppose the defect results from some other cause.

That a defect of that type is caused from a slight blow off the three cornered point of sand forming the intersection can be shown by ramming up, in close sand, a piece as in Fig. 2. Run a vent wire almost to the pattern directly into the corner *A*. The vented corner will show solid, while a depression or draw likely will show in the unvented corner. While probably it is not possible to overcome such defects entirely with an open backing sand, since the heat-attack is severe on the three sides of the thin point of sand, this will serve to show that certain types of surface defects can be caused by permitting the easiest exit for gases or steam through the metal in place of through the sand.

Another example of about the same thing is shown by the large pipe plug in Fig. 3. The foundry making this casting was having trouble with what was called draws in the corners *A*. Increasing the riser gave no better results. The trouble disappeared as soon as the center portion was hollowed, out as at *B*, in Fig. 4, to allow the gases to escape through the sand. Sand was pulled out of the pocket through the bottom of the mold with a tubular sprue cutter before placing the bottom board. The riser was decreased materially, giving a perfectly sound casting.

Use of coarse, open sand on the mold face, particularly near the gates, often is the cause of dirt in the castings, a certain type of sponginess, as well as burning-on at the surface. This is due to the penetration of the molten steel between the grains, seizing them, and pulling them into the casting along with the metal. The most serious is in gases liberated from the metal by the reaction of the loose particles of sand on the molten steel. Pin-holes and larger gas-cavities, and a general spongy, dirty casting results. Such sponginess is accompanied by brittle metal with low ductility and poor strength.

Caused by Minute Blow

Pin-holes, or porosity constitute a frequent source of trouble in the steel foundry, particularly where a conscientious effort is made to eliminate the use of aluminum to insure good physical properties. This defect usually is attributed to poor steel, probably because it is not as prevalent in dry sand as in green sand, and can be controlled by the addition of aluminum. Steel that in itself is poor enough to cause pin-holes will show its poor quality in other ways, such as by coming back in the risers, and failure to shrink down. A close examination of a pin-hole will show that the cavity is a mere pin-prick at the surface of the casting, enlarging in pear-shape as it enters deeper into the metal, demonstrating that it is caused by a minute blow from a projecting particle of sand.

With suitable provision for a freer exit of gas through the mold than into the metal, pin-hole troubles largely will disappear, and if the mold face is kept below a certain moisture content, the amount of the

(*Concluded on Page* 54)

ALLOY CAST IRON

is

Here to stay!

Nichrome* B is an easy, practical, flexible, economical means of making an alloy addition. When added to cast iron it produces castings of dense grain structure and reduced porosity, harder castings that withstand wear and abrasion.

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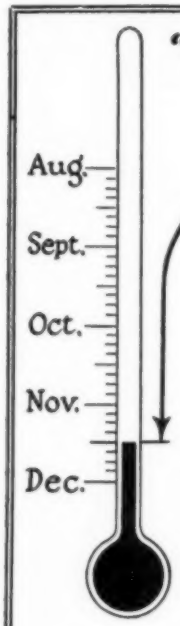

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The actual experience of representative foundrymen as recorded in the extracts from their letters given below proves that you, too, will save money, time and effort with Quandt Core Oil. Because it eliminates those frequent elements of failure heretofore thought inherent in casting practice; because of the tremendous cuts possible in operating costs as a result of its use; because of its production of uniformly sound, flawless castings;

QUANDT CORE OIL

is the most economical core oil ever offered to the foundryman.

Forgive us if we sound too positive. It's the result of listening to foundry users, of reading in enthusiastic letters such comments as these:

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"Your oil will not migrate, neither do the cores distort."

"Quandt Core Oil has eliminated cracking of castings due to the ready collapsibility of cores . . ."

". . . cores made with your oil are always 'true to pattern.'"

"Quandt Core Oil creates very little, if any gas, and this naturally eliminates the loss of castings due to core blows."

". . . our losses of castings which were caused mostly by core blows, have now been practically eliminated. . . your core oil gives off less gas than any other oil we have used heretofore."

". . . even without a vent, the castings are sound."

"Since using your core oil we do not know what core blows are. We have eliminated all venting of cores."

". . . there is very little gas and the molten metal lays quietly around the cores."

". . . particular good results from it in alloy castings made entirely in the core, where it is absolutely necessary to eliminate gas for pressure castings."

". . . makes it possible to use a much finer grade of sand. . . "

". . . very good where extreme accuracy in cores is necessary."

". . . no sagging of cores, . . . cores do not check when using Quandt Core Oil."

". . . we have eliminated bedding sand . . . where formerly it was absolutely necessary."

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(*Concluded from page 52*)

gas or steam is reduced. It sometimes is said that over-annealing will cause pin-holes. What actually happens is that the casting surface, removed by the scaling action of a severe anneal, exposes the enlarged area of the pear-shaped cavity. Of course gas holes do appear in unsound metal, but the holes are more nearly spherical in shape, and are not concentrated on the surface, or in one particular spot, as is the case with the genuine pin-hole. Often a gas hole will be found to contain a particle of sand, showing that it was caused by a blow from a loose particle of sand entrapped in the steel.

The best of steel in the fluid state is in a delicate state of equilibrium, easily upset by introduction of foreign matter. It requires time to allow such foreign matter to rise to the surface in the furnace or in the ladle. The more finely divided the foreign matter, the slower it will rise, and there is a degree of fineness beyond which the material will not rise at all. Consequently great care must be taken that sand is not allowed to mix with steel, either in the ladle, or while filling the mold. A small amount of sand will cause the evolution of a large volume of gas.

The major portion of casting defects, particularly dirt, sponginess, pin-holes and surface defects are traceable to the condition of the molding sand. These troubles largely are due to the condition of the sand at and near the gate. No matter how suitable the sand may be, gates must be designed, located, and made properly.

This is the first of two articles discussing some of the important points in the production of small steel castings. The second section will appear in an early issue.—THE EDITORS.

Committee Sets Dates for Congresses

The annual meeting of the International committee of foundry technical associations was held at Prague, Czechoslovakia, on Sunday Sept. 10, on the occasion of the foundry congress. R. W. Maas Geesteranus, president of the Dutch foundry association, was in the chair as president of the International committee.

The following countries were represented: Holland, by Mr. Maas Geesteranus and Mr. de Keiser; Czechoslovakia, by Professor Pisek, president of the Czech association; Belgium, by J. Leonard, president of the Belgian association; France, by H. Magdalenat, president of the French association; Germany, by Dr. Meyersburg; Great Britain, by John Cameron and V. C. Faulkner, past-presidents of the Institute of British Foundrymen; Italy, by Guido Vanzetti, president of the group of Italian steel foundries; Poland, by K. Gierdziejewski, president of the Polish foundrymen; Spain, by M. Navarro Alcacer, president of the Spanish foundrymen, and the United States, by Vincent Delport, European manager of THE FOUNDRY and representative of the American Foundrymen's association. Tom Makemson, honorary secretary of the committee, was present.

After passing the minutes of the previous meeting and the accounts, Vincent Delport presented for second reading the rules governing the exchange of papers, which had been proposed by him in Paris in 1932 on behalf of the American Foundrymen's association. These rules were adopted unanimously, and it was decided that they should be permanently added to the by-laws of the International committee.

The report on progress made in the preparation of the international dictionary of foundry terms was discussed, and it was decided to continue the preliminary work of preparing in each country a list of definitions of foundry terms, which will serve as a basis for the dictionary. It was recommended that, when necessary, a simple sketch should accompany the definitions of each word.

Vincent Delport then extended, on behalf of the American Foundrymen's association, an official invitation to all foreign technical associations to attend the Fifth International Foundry congress in the United States in 1934. The president of the International Committee acknowledged this invitation on behalf of all the associations represented, and expressed in their names their thanks and appreciation for this invitation.

The calendar of future international meetings was then discussed, and dates for the next four years are as follows: 1934, United States, Fifth International Congress; 1935, Belgium; 1936, Germany, Sixth International Congress; 1937, France.

The meeting then proceeded with the election of officers for the coming year. Professor Pisek, president of the Czech foundry association, was unanimously elected president, and K. Gierdziejewski, president of the Polish group, was unanimously elected vice-president.

At the close of the meeting, Mr. Navarro Alcacer announced that Spain was organizing a foundry technical association. The president of the International committee also announced that the Hungarian group had applied for representation on the committee, and their application was accepted unanimously.

The first regular meeting of the fall season of the Detroit Foundrymen's association was held at the Brooklands Golf and Country club, Detroit, Thursday, Sept. 21. Fred J. Walls is president of that organization.

Publishes Report on Power Conference

American Foundrymen's association, 222 West Adams street, Chicago, has published a report on the conference on "Electric Power Costs in the Foundry" which was held at the recent convention in Chicago. In addition to presenting a verbatim report of the discussion, publication also includes a summary of answers to the questionnaire on electric power costs which was presented to the industry previous to the meeting. The report may be secured through the association for $1.00.

The electric power costs committee is as follows: W. B. Wallis, Pittsburgh 'Lectromelt Furnace Corp., Pittsburgh, chairman; R. D. Brizzolara, American Steel Foundries, Chicago; C. S. Anderson, Belle City Malleable Iron Co., Racine, Wis.; W. R. Jennings, Frank Foundries Corp., Moline, Ill.; James R. Allen, International Harvester Co., Chicago; and James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.

Labor Cost Increase Is Shown

Necessity of extensive wage readjustments under recently established minimum wage standards is indicated in an analysis of average weekly earnings and average hours of unskilled male labor in 1926 and in May and June, 1933, just issued by the National Industrial Conference board. While the average weekly earnings of unskilled male workers increased generally during June, 1933, as compared with May, they were still considerably below the 1926 level. The average amount per week received by unskilled male labor in 21 major manufacturing industries was $15.83 in June, 1933, as compared with $14.42 in May. The corresponding figure for the year 1926 was $23.22.

In May, 1933, the average hours per week were less than 35 in only 7 of the 21 manufacturing industries included in the Conference board's tabulation; in the following month the average was above that level in every industry. Although average weekly earnings of unskilled workers are uniformly below the 1926 level, the average number of hours per week in June, 1933, nearly reached the 1926 average in several cases and actually exceeded that average in 4 industries. Material increase in labor cost and average hourly earnings of unskilled labor is indicated with the introduction of the 35-hour week with weekly earnings maintained at former level or increased to a $14.00 minimum.

ADVERTISING PAGES REMOVED

Weigh All Air Entering Cupola

(*Continued from Page* 24)

Specific heat of cast iron from 60 to 2260 degrees Fahr. is 0.19. The specific heat of cast iron becomes greater as the temperature rises. Between 2260 and 2850 degrees Fahr. the average value is 0.23 and the latent heat of fusion is 41.5 B.t.u. B.t.u. required to melt and superheat one pound of iron to 2700 degrees Fahr. may be determined by the following calculations:

0.19 × (2260 — 60) = 418 B.t.u.
(Superheating) 0.23 × (2700—2260) = ... 101
Heat of fusion = ... 41.5

Total B.t.u. for 1 pound of iron = ... 560.5

For a 20,000-pound heat the total B.t.u. required would be 20,000 × 560.5, or 11,200,000 B.t.u.

Using coke with a carbon content of 90.00 per cent, one pound burned completely to CO_2 would produce 0.90 × 1.00 × 14,550, or 13,100 B.t.u. Hence the weight of coke required to produce 11,200,000 B.t.u. would be 11,200,000 ÷ 13,100 = 855 pounds.

At 100 per cent efficiency 855 pounds of 90 per cent carbon coke should melt 20,000 pounds of iron, a melting ratio of 23.4 to 1. Of course this efficiency cannot be obtained, but an efficiency of 35 per cent can be obtained without difficulty.

At 35 per cent efficiency the weight of coke necessary will be 855 ÷ 0.35 = 2443. The melting ratio then will be 20,000 ÷ 2443 = 8.11, or approximately 8 to 1, a figure close to the average melting ratio in gray iron foundries.

A calculation covering the operation of a 54-inch cupola on the basis of carbon charged and oxygen supplied by 90 per cent carbon coke for a 15-ton heat might be set down as follows:

	Carbon pounds
Bed coke 1200 pounds	1080
Iron charge 2000 pounds	
Total iron 30,000 pounds	
Single coke charge 180 pounds	162
14 coke charges 2520	2268
Total coke 3720 pounds	3348

B.t.u. required to melt and superheat 30,000 pounds of iron to 2700 degrees Fahr. may be set down as: 560 × 30,000 = 16,800,000. According to the foregoing calculation 3348 pounds of carbon are available. At 35 per cent efficiency this should yield: 3348 × 14,550 × 0.35 = 17,060,302 B.t.u. This is 260,302 B.t.u. in excess of the amount required to melt and superheat 30,000 pounds of iron to 2700 degrees Fahr.

Knowing that 359 cubic feet of air under standard conditions contain 6.72 pounds of oxygen and that 6.72 pounds of oxygen will burn 2.52 pounds of carbon to CO_2 making available the maximum number of B.t.u., and further calculating on the basis of 162 pounds of carbon per charge in the foregoing example we find that

$$\frac{162}{2.52} \times 6.72 = 432 \text{ pounds of oxygen.}$$

Where 432 pounds of oxygen are required to burn 162 pounds of carbon to CO_2, then it follows that the mols of air required to supply 432 pounds of oxygen under standard conditions will be 432 ÷ 6.72 = 64.3 mols. The cubic feet of air required under standard conditions will be 64.3 × 359 = 23,080 cubic feet per charge or ton of iron. In this instance the cupola melts at the rate of 10 tons per hour, therefore the amount of air required per minute will be

$$\frac{23{,}080 \times 10}{60} = 3846.$$

For purpose of further illustration assume a case other than standard:

Temperature, 62 degrees.
Barometer, 14.25 pounds.
Carbon per charge, 162 pounds.
Oxygen required, 432 pounds.
Mols of air, 64.3.

Calculation shows a change in volume of the mol as follows:

$$359 \frac{460+62}{460+32} \times \frac{14.7}{14.25} = 385 \text{ cubic feet.}$$

The cubic feet of air required with the new mol to supply 432 pounds of oxygen follow:

$$385 \times 64.3 = 24{,}755.5$$

and the cubic feet of air supplied per minute will be:

$$\frac{24{,}775 \times 10}{60} = 4126$$

In a typical 30-day period this system of weighing air for a 54-inch cupola showed that the atmosphere temperature varied from 8 to 68 degrees Fahr. Barometric readings varied from 14.2 to 14.55 pounds pressure and the volume of the pound mol varied from 350 cubic feet to 394 cubic feet.

With this system of weighing and calculating cupola air the cupola blast was reduced from 5500 cubic feet of air per minute to between 3800 and 4300 cubic feet per minute with the result that there was less patching to do from day to day in the melting zone, and cupola operations were improved to a considerable extent. Temperature of iron at the spout always was above 2700 degrees Fahr., and in most cases close to 2800 degrees with better uniformity of iron temperature from the first step.

The linear thermal expansion of 36 materials is discussed in research paper RP562 recently published by the bureau of standards. The paper is entitled "The Thermal Expansion of Refractories to 1800 Degrees Cent." and was prepared by R. A. Heindl. Copies may be obtained from the superintendent of documents, Washington, for 5 cents each.

Will Manage Air Preheater Corp.

Superheater Co., New York, recently acquired an interest in and assumed the management of the Air Preheater Corp., Wellsville, N. Y., manufacturer of air preheaters. The Air Preheater Corp. will retain its corporate identity under the new management and will continue the manufacture of its product at the Wellsville plant. Executive offices of the company will be consolidated with those of the Superheater Co. at 60 East 42nd street, New York, and sales activities will be co-ordinated with the industrial department of the Superheater Co. under the management of William T. Conlon.

The new officers of the Air Preheater Corp. are as follows: F. A. Schaff, president; H. S. Colby, vice president; M. Schiller, vice president and treasurer; T. F. Morris, secretary and assistant treasurer; H. S. Marshall, assistant secretary and assistant treasurer. Directors are Geo. L. Bourne, chairman; W. L. Batt, H. S. Colby, R. M. Gates, F. A. Schaff and M. Schiller.

Engineers Plan Foundry Practice Session

American Society of Mechanical Engineers will include a session on foundry practice at its annual meeting to be held in New York the first week in December. The program for that session is being arranged by the Foundry Practice committee functioning under the Machine Shop Practice division. Two papers have been scheduled thus far as follows: "Welding versus Casting" by E. P. Strothman, American Steel Foundries, Chicago; and "The Meaning of Transverse Tests for Cast Iron" by James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

Paper Referred To Effect of Manganese

An error inadvertently was made in reporting the presentation of the French exchange paper at the Chicago convention of the American Foundrymen's association in the July issue of THE FOUNDRY. A statement on page 47 should have read: "The author also discussed the effect of silicon, manganese and nickel, pointing out that manganese over 2 per cent favors that type of treatment."

Cast Steel in Europe and America

(*Continued from Page* 18)

molds are made up by assembling the cores, has been employed successfully for many years in certain foundries in the United States. However, the method is not adapted economically for the majority of steel castings, particularly those made in general jobbing shops which cater to the navy.

Major Bull believes that foundrymen generally will cordially support Captain Shane's opinion that the pickling of steel castings for most purposes is highly undesirable. Painstaking researches show that there is an important relationship between deterioration from corrosion and that from mechanical stress.

Favorably Impressed with Practice

The conclusion of Captain Shane's article leads Major Bull to infer that he has been more favorably impressed by the practices and products of foreign steel casting plants than with those in America. A question of this kind cannot be settled without such a comprehensive examination as no American visitor possibly could make in a few months. One cannot judge merely by the appearance of the product. One may get a fair idea of the probable nature by noting closely the details of practice, following experience enabling the observer to understand the significance of all major details of steel foundry technique.

Major Bull ventures the assertion that a complete understanding of all the complex details of steel foundry technique, coupled with comparable familiarity with modern methods of manufacture of many wrought metal parts, would result in the definite conviction that with a given degree of effective supervision, a given degree of craftsmanship and a given degree of modernization of suitable plant equipment, the very nature of required operations for the manufacture of miscellaneous steel castings is such as materially to increase the probability factor relating to imperfections in the product. The foregoing immediately involves the consideration of *what is supervised*.

The human element bulks large in the steel foundry where miscellaneous castings are produced, necessitating supervision of workmen to an extent unlike that where, for example, steel rails, plates, I-beams, etc., are rolled, or where drop forgings are made. The experienced steel foundryman has learned many important lessons needed for the successful choice of methods for any given type of casting, including location and size of gates, position and dimension of risers, sand characteristics of mold and cores, employment of gaggers, chaplets, core arbors, chills, nails, etc. Under normal conditions in the jobbing shop the superintendent daily has a great many designs of castings to produce, which differ in some important dimensional characteristics from any previously made in the shop. In many instances the small number and the delivery required, prevent any preliminary practice customary when a large number of duplicate castings are ordered. For the great majority of miscellaneous castings the shop men have to depend on experience with somewhat similar castings.

Judicious sand control, proper furnace manipulation and other applicable factors are necessary irrespective of the design. The foundryman realizes that the fluidity of the steel, largely determined by the temperature, is a factor that influences the ultimate condition of the casting to some extent. However, the jobbing foundryman, despite his efforts to segregate the molds, usually has a large variety of cross sections in the castings to be poured from each heat.

In Major Bull's opinion, actual experience in running a jobbing steel foundry quickly would dissipate any idea that it is readily adaptable to the satisfactory predetermination of many technical details which influence the result. The jobbing steel foundry always will be a practical laboratory for the daily attempted solution of new problems. Manufacturing methods cannot be standardized except where the product by a reasonable degree of duplication permits the adoption of methods that usefully may be repeated.

Should Have Uniform Thickness

For metallurgically sound reasons the ideal steel casting should have uniform thickness of members. Unfortunately for innumerable purposes it is necessary that steel castings be made with many cross sectional inequalities, some quite pronounced. For many applications, compromises in design could be developed without handicapping the assembly. The total weight of the piece is an important factor in navy design. Captain Davis, another commentator, has emphasized that stability, obtained in large degree by weight alone, should not be sacrificed when designing steel castings with proper regard for minimum advisable weight. A happy medium may be struck in these cases. Also irrespective of the metal or whether the part is cast or wrought, the relatively small fillet is a handicap to stress resistance.

Design is closely associated with results obtained from heat treatment. The research at Anacostia with great profit might be extended to cover the determination of what happens to the steel casting of a design supposedly presenting the maximum condition as to possible hazard, when it is permitted to cool unrestrictedly in the air from the customary normalizing temperature; and what subsequently happens to the piece after it is properly tempered. The investigation very usefully might be extended further to ascertain the effects from liquid quenching.

More extended investigation into the use of chills may convince the investigators at Anacostia that restriction to horse shoe nails and wire coils would not meet all requirements for remedying defective design. Improperly used chills may have produced more trouble than benefit. The contention in Major Bull's opinion is debatable and not subject to proof. Admitting that chills, especially large chills are a necessary evil, it is important for designers to realize the extent to which they may be able to make the employment of these devices less frequent.

Regarding personnel he agrees with that part of C. W. Briggs' statement that the steel foundry today needs technically trained men who know a great deal about theory; but emphatically he does not agree with the latter part of the same statement that "We need men who know a great deal more about theory and less about the mechanical application of molding."

Many Factors Involved

The mechanical application of molding involves a great deal and consistently can include casting design. Much more than mere craftsmanship is involved. *That* must exist, plus understanding of and adaptation to the phenomena that occur throughout the filling of the mold and the progressive solidification and cooling of the casting. Facts most important to acquire for the successful supervision of such work can be obtained only by the application of theory to much practice on the molding floor. The relationship is intimate eventually making of the preferred type of steel foundry executive an individual of composite qualifications. Metallurgy, mechanical engineering, and craftsmanship are connected inseparably for the routine task of competently running a steel foundry that makes a considerable variety of metals and shapes for many purposes.

Major Bull expressed his hearty agreement with much that had been contributed by P. E. McKinney and George Batty. Their long experience qualifies them as experts in shop practice. Inherently they have the co-operative attitude that characterizes all progressive steel foundrymen toward the consumer. Eminent technicians who by no means constitute a small minority among American foundrymen are thoroughly conversant with the vast difference that exists in the problem of the producer of specialties or merchant shapes and the problems faced in the miscellaneous steel foundry.

The more experience we have in

(*Concluded on Page* 60)

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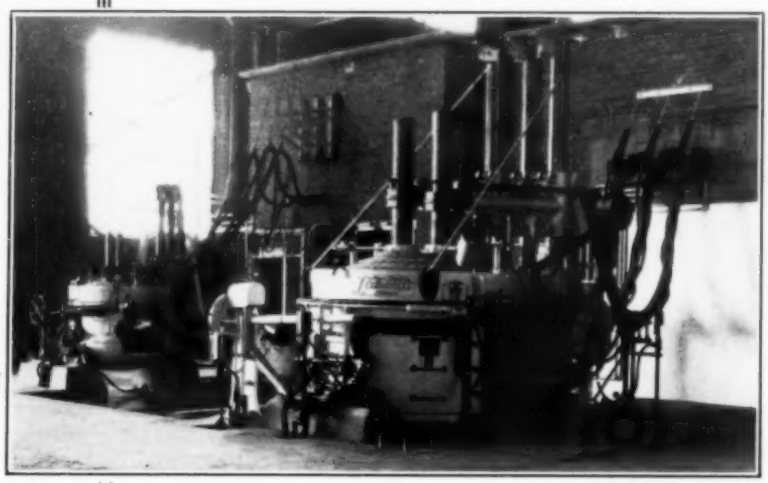

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American Malleable Cast Iron

By H. A. Schwartz

This book is the first complete treatise on "black hearth" malleable iron ever published.

It covers the history of the malleable industry—its development, modern methods of manufacture, metallurgical principles involved and the properties and uses of American malleable cast iron. It also includes a detailed bibliography in which all the important books and articles published pertaining to malleable iron are listed and represents the only reference work available on the subject.

While written primarily for the producer and user of malleable castings, this book is also adapted to the needs of the technical student and the library.

"American Malleable Cast Iron" is the only book on malleable iron in print.

Price, Postpaid: $7.15 in U. S. and Canada; 35s. 9d. in other countries.

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(*Concluded from Page 58*)

steel casting manufacture, in Major Bull's opinion, the more we realize the extent of our ignorance in respect to this extremely complex operation of trying to make a thoroughly dependable and presentable product, of almost any conceivable shape and weight, from a more or less temperamental metal poured into a cavity formed largely from what would be called dirt by the average man on the street. He would suggest that despite the indifference of what probably is a small minority of steel foundrymen regarding the high quality of material required by the navy, its investigators ultimately might be inclined to concede to the majority of the foundrymen in this large industry, a considerable degree of practical application of scientific knowledge, qualifying them technically without disparagement in contrast with manufacturers of other metal products.

Files Code for Crucible Industry

The code of fair competition for the plumbago crucible industry, filed by the Crucible Manufacturers association and representing 96.4 per cent of the volume of business, fixes a minimum work week of 40 hours with certain exceptions, not more than 48 hours in any one week, provided that employees may be permitted to work 48 hours per week no more than one week of any month, in case of temporary burden of production. The code further provides a tolerance of 10 per cent over 40 hours for maintenance crews and also excepts from the maximum hours service men, outside classifications, and those in a supervisory capacity receiving more than $35 per week.

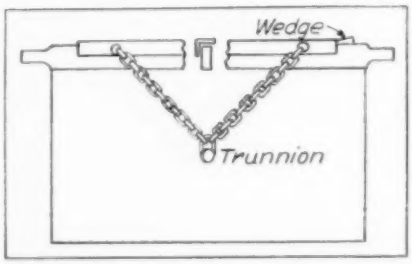
Minimum wage is 40 cents an hour except for office staffs and sales and service employees for whom the minimum wage is $15 per week as provided in the code. Learners are to receive 80 per cent of the minimum wage and are not to exceed 7½ per cent of the total employees.

Chain Sling Holds Cope on Pot Mold Flask

Although the type of clamp shown in the accompanying illustration is rather limited in application, it presents many commendable features and might be adapted to meet other conditions and requirements. The principal disadvantage is the initial cost, but that feature is offset by the ease of application and the time saved each day in the clamping process. One or two sets will serve an entire floor since they can be shifted easily between the arrival of ladles.

In one malleable iron foundry it is employed on the flasks containing the pot molds. In some foundries these pots are poured in open sand molds but in this particular shop the pot carries a recess or shoulder on the top edge and for that reason a cope is required. The iron surface pressing against the cope is small and therefore the lift is almost negligible. The weight of the drag plus the friction of the sand is sufficient to anchor the cope and prevent it from rising.

The drag is provided with a small trunnion on each side to facilitate rolling the drag over in a pair of light slings suspended from a hoist. After the mold is closed the clamps are attached to each side. A large link at the junction of the two chains engages the trunnion and the



The angle iron on the cope is wedged at one end

piece of angle iron at the top rests on the top edge of the cope side. The molder lifts one end of the angle iron with a short pinch bar and slips a wedge between the angle iron and the top of the cope side. Thus he only has two points to attend to instead of the usual four points. The clamp is disengaged just as readily after the iron is poured by knocking out the wedges.

Book Review

S. A. E. Handbook, 1933 edition, fabricoid, 733 pages 5½ x 8½ inches, published by the Society of Automotive Engineers, New York, and supplied by THE FOUNDRY, Cleveland, for $5 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

Current standards and recommended practices adopted by the Society of Automotive Engineers, including new and revised specifications issued during the past year, are presented in this handbook. Individuals or companies in any way interested in the wide variety of materials used in the automobile industry will find this handbook of considerable value. The enlarged page size inaugurated with this edition should meet with the approval of all.

The material in the book is divided into 10 sections and a new group classification of the standards has been adopted so that the specifications are grouped according to type rather than to the particular kind of automotive apparatus to which they may apply, since in many cases specifications apply equally to more than one kind of apparatus. A general index permits specifications to be located readily.

Section one includes dimensional standards for units, parts and finished constructional materials used in automotive apparatus such as motor vehicles, aircraft and motorboats, in their component assemblies and in accessory equipment. Section two gives S.A.E. specifications for ferrous and nonferrous metals, petroleum and other processed materials used in fabricated or finished products. Tubing, extruded shapes, leather, glass and other fabricated material specifications are included in section three.

Other sections deal with screws, bolts and washers; tests, ratings and codes; transportation and maintenance; tools and production equipment; nomenclature and definitions; miscellaneous specifications; standard committee regulations; American standards; and standards committee personnel.

Publishes Papers On Good Housekeeping

American Foundrymen's association, 222 West Adams street, Chicago, has published a pamphlet containing the proceedings of the foundry housekeeping conference held in Chicago during the recent convention. The pamphlet contains the following papers: "The Dust Problems in the Foundry Industry" by E. G. Meiter, Employers Mutual Liability Insurance Co., Milwaukee; "Legal Aspects and Employer Responsibility" by Alfred C. Hirth, Williams, Eversman & Morgan, Toledo, O.; and "Keeping a Clean and Orderly Foundry" by A. D. Lynch, Ohio Brass Co., Mansfield, O.

Is Made President

A. J. Johnston recently was elected president of Hickman, Williams & Co., succeeding the late T. C. Ward of Pittsburgh. Since joining the organization in 1913, Mr. Johnston has been located in Chicago, and will continue to maintain headquarters there.

Mr. Johnston was born in Oconto, Wis., June 19, 1890, and received his college education at the University of Wisconsin, where he studied chemical engineering with special training in metallurgy. Following his graduation in 1913 he became identified with Hickman, Williams & Co. at Chicago as a metallurgical salesman. Subsequent promotions brought him to the position of resident manager at Chicago in 1919, and in 1929 he was made vice president in charge of the Chicago office. Since 1930 he had been assistant to the president.

The GRIFFIN

Hot-Blast Process for CUPOLAS

THE Griffin Hot-Blast Process reduces coke consumption more than 25 per cent, permits the safe use of more scrap in the charges, improves the melting and pouring practice at every stage from start to finish, promotes safety, assures greater uniformity and better quality of the finished castings and greatly reduces rejection losses.

TO the thermal and net money benefits of cupola hot-blast and high heat recovery from cupola gases, the Griffin Process further adds the distinct advantage of continuous cupola flow into teapot-spout reservoir and mixing ladle, and transfer to the moulds in bottom-pouring ladles, for triple elimination of slag and maximum efficiency of sulphur control.

All installations to date have shown a net return of at least 50 per cent on the investment.

Write for revised Bulletin No. 532

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European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Cupola Malleable

Synthetic Manufacture of Cupola Malleable from Scrap-rich charges without Malleable Pig Iron (Die synthetische Herstellung von Kupolofentemperguss aus schrottreichen Gattierungen ohne Temperroheisen), by Dr. Rudolf Stotz, *Die Giesserei*, Dusseldorf, Germany, Aug. 4, 1933.

The author discusses the use of steel scrap additions in the manufacture of cupola malleable, and claims that with the employment of malleable pig iron, even though steel scrap additions up to 33 per cent are made, that the total carbon content cannot be reduced below 3.2 per cent. However, by eliminating the malleable pig iron and using ferrosilicon and ferromanganese to give the required contents of those elements, the total carbon content is maintained at not over 3.1 per cent. He gives tensile strength values from two different foundries as 58,000 pounds per square inch with 7.5 per cent elongation, and 75,000 pounds per square inch with 4.8 per cent elongation. One foundry previously using 22 per cent pig iron, 18 per cent scrap steel and 60 per cent returns changed to 5 per cent ferroalloys, 35 per cent steel scrap and 60 per cent returns with a saving of over $7000 in 1931. Another foundry employing 24 per cent pig iron, 26 per cent steel scrap, and 50 per cent returns changed to 6 per cent ferroalloys, 44 per cent steel scrap and 50 per cent returns with a saving of about $1612 in 1931.

Powdered Coal-Melting

Rotary Melting Furnace Fired By Pulverized Coal, (Le Four Rotatif de Fusion Chauffe au Charbon Pulverise), by J. Goffart and F. Boussard, *La Fonderie Belge*, Liege, June-July, 1933.

This article describes the advantages of the rotary furnace for making high-duty, heat-resisting and other special cast irons. The *Sesci* furnace, which is installed in the foundry of Compagnie Generale des Conduites d'Eau des Vennes, at Liege, is described. This furnace has been previously described in THE FOUNDRY.

The type of fuel to be used is discussed, and the procedure for the maintenance of the burners is given. For the operation of these furnaces, two types of coal are required, one of which, for the lighting of the furnace, is of the following composition: Volatile matter, 24 to 28 per cent; ash, 13 to 14 per cent; water, less than 3 per cent, and a minimum of sulphur. Once the furnace has been properly started, the operation is effected with coal having 7 to 12 per cent of volatile matter, 7 to 10 per cent ash, less than 3 per cent water, and a minimum of sulphur.

Corrosion

Corrosion of Cast Iron in Various Media, (La Corrosion de la Fonte dans les Divers Milieux), by A. Travers. *La Fonte*, bulletin of the French center of Foundry research, Paris, April-May, 1933.

Hydrochloric acid attacks all ferrous metals. Sulphuric acid of a concentration of from 60 to 100 per cent does not attack cast iron at ordinary temperatures and only slightly at higher temperatures. Nitric acid is a strong corrosive of gray cast iron.

Additions of silicon under 3 per cent tend to increase corrosion, whereas with higher contents of silicon the iron resists attacks, even by hydrochloric acid. Phosphorus irons appear to show greater resistance to nitric acid than nonphosphorus irons. The action of organic acids is important, owing to the use of cast iron in chemical plant; and fatty acids and solutions of phenol are strong corrosives.

With regard to corrosion by salt solutions, the graphite-pearlite couple is not so intense as is the case with acids, and a film of oxide soon covers the iron and protects it against further action by salt water. On the other hand, corrosion is intensified by parasitic electro-currents, and this remark is of importance in connection with cast-iron pipe in which salt water is carried. Alkaline solutions generally protect ferrous metals, and cast iron is utilized for the concentration of certain alkaline solutions.

Cupola Linings

Refractory Lining of Cupolas, (Le Revetement Refractaire du Cubilot), by L. Longchambon, *Bulletin* de l'Association Technique de Fonderie, Paris, July 1933.

The author reviews the many ways in which a rapidly attacked lining decreases the efficiency of the cupola and causes waste. He then shows in what direction investigations could be carried out.

A diagram shows the melting point of the mixture of alumina and silica, starting at each extremity with the pure product. This diagram shows that most of the siliceous material used in foundries visited by the author has a composition corresponding to practically the lowest melting point indicated on the diagram. A general fallacy concerning siliceous material is to confuse it with quartz, which is not stable above 950 degrees Cent. A lining should be made with a siliceous material of low density, such as is used in glass furnaces. Linings can be made easily by grinding together silica bricks with 4 or 5 per cent of lime or green clay, and such linings might prove to be satisfactory.

Usually aluminous material employed in its natural state is unstable and easily attacked. The material should be heated at a high temperature so that its elements will be properly combined. Assuming that in the cupola the temperature reaches 1500 degrees Cent., that is just the temperature at which this recombination of the elements of the lining takes place. Good bricks could therefore be made with a material containing 25 per cent of alumina which has been previously heated at the highest possible temperature, and the cupola itself will complete the operation of stabilizing the material. A material for monolithic linings could be similarly prepared.

ADVERTISING PAGES REMOVED

Study Effect of Codes

(*Concluded from Page* 13)

all their personal and business affairs and have devoted their whole time and attention to this semipublic service. No one, unacquainted with Washington procedure, can appreciate the days of intensive hard work, the multiplicity of conferences and private hearings that precede the public hearing. Under the prevailing practice the private hearings and group meetings with administration representatives serve to adjust differences and to formulate a code which when it appears at public hearing is practically in form for final agreement. The public hearing really is the epilogue to days and nights of hard driving work.

The cost to the four branches of the foundry industry through direct expense involved in association work preliminary to the approval of the four basic codes is estimated as between $60,000 and $75,000. This takes no account of the value of the time of the foundrymen who have given their whole thought to NRA since June and many of whom will continue to serve on association boards or code authorities when codes are in operation.

The cost of administration of these foundry codes is variously estimated at from $150,000 to $300,000 annually. This will include executive and staff salaries, cost work, price reporting, compilation and reporting to the government or code authorities statistics on labor phases and the enforcement of adherence to fair trade practice phases.

In commenting upon the prospective expense one foundryman, making specialty work said:

"This NRA means to each one of us, just what we make of it. The government gives us a chance to do something for ourselves and it's worth what we pay for it even if it costs 30 cents to a dollar a ton. I'm satisfied if we can end some of this senseless price cutting and I am willing to pay what it costs to get rid of the kind of competition we have had for the past three years."

Therein lies the only asset feature from the industry viewpoint. Unless and until each branch of the industry is set up to function as a merchandising and business concern, the balance lies on the debit side. A real appreciation of the new competitive conditions needs to be inculcated into every foundry owner. The NRA by no means provides insurance against vicious or foolish business practices. But, properly financed and managed trade associations backed and empowered by the law and a sincere co-operative attitude can accomplish much, is the belief of those in present positions of leadership.

In this connection, the revamping of existing organizations, such as led to the formation of the Malleable Founders' society, earlier noted in THE FOUNDRY and the recent merging of all interests in the Gray Iron Founders' society, reported in this issue, point the trend. Those responsible for the change in form and function of these associations believe that business activities under the NRA will point the way to advancement in their respective fields.

Discusses Alloys At Quad City Meeting

"High Test Cast Iron Practice" was the subject of an interesting talk by Frank W. Shipley, metallurgist, Caterpillar Tractor Co., Peoria, Ill., at a meeting of the Quad-City Foundrymen's association held at the Blackhawk hotel, Davenport, Iowa, Sept. 18. Harry F. Henninger, International Harvester Co., Rock Island, Ill., the new president of the association, presided at the meeting, which was attended by approximately 50, including representatives from Burlington, Iowa, Peoria and Kewanee, Ill., and St. Louis.

Mr. Shipley discussed the use of high test cast iron in industry, and explained how alloys are employed to obtain higher physical properties. He commented on the use of an alloy cast iron for piston rings, which also are heat treated to provide greater wearing qualities. He also showed several castings of high test cast iron and provided a number of interesting micrographs illustrating the structure of various alloyed irons.

The next meeting of the association will be held Oct. 16 and will be devoted to a discussion of "Malleable Cast Iron."

Book Review

Labor Relations Under the Recovery Act, by Ordway Tead and Henry C. Metcalf, cloth, 259 pages 5 x 7½ inches, published by Whittlesey House, McGraw-Hill Book Co., New York, and supplied by THE FOUNDRY, Cleveland, for $2.00 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

This volume has been prepared primarily to supply practical aid to trade associations, employers and others interested in methods of organizing and dealing with employes in industries which come under the National Industrial Recovery act. The authors point out that the study is offered without the pretense of special inside knowledge of the construction which will be put on the act as its administration proceeds.

The authors first discuss the general problem under the heading "The New Industrial Partnership". This is followed by several chapters concerned with the principles and means of introducing some plan of employe representation. Further discussion deals with the business values as well as the special difficulties which are met in the effort to carry on collective dealings with labor unions. It is stated in a discussion of the experience of trade associations in the whole field of labor relations that experience has shown the broader and more inclusive the interest which a trade association shows in various labor problems of its members, the stronger is its position today in developing and elaborating further policies looking to assure employe cooperation.

Is Made Manager Of Equipment Division

Donald J. Reese recently was appointed manager of the foundry equipment division, Whiting Corp., Harvey, Ill. Mr. Reese has been connected with the Whiting organization since 1920, and for several years was in charge of the gray iron and steel foundry at the Harvey plant.

Mr. Reese is a graduate of the University of Michigan, Ann Arbor, Mich., and has done special work on foundry and general metallurgical subjects. In addition to his contact with practical foundry problems including his field work, he spent some time in Germany in connection with the developing of the rotating pulverized-coal fired furnace. He has taken an active part in association work and is vice president of the Chicago Foundrymen's club.

Standard Work Is Transferred To A. S. A.

Duties of the division of trade standards, division of simplified practice, safety code section and the building code and plumbing code sections of the building and housing division of the bureau of standards has been transferred to the American Standards association by Secretary of Commerce Roper.

A Correction

Through a typographical error the captions for Figs. 9 and 10 in the article "Phosphorus in Cast Iron" on page 16 of the September issue of THE FOUNDRY were transposed. The micrograph shown on page 9 should be marked Fig. 10 and the one indicated as Fig. 10 should be labeled Fig. 9. Also on page 18, the machine to determine wear resistance is known as a Spindle machine.

Obituary

FREDERICK M. DEVLIN, 57, president of the Philadelphia Hardware & Malleable Iron Works, died recently at his home in Philadelphia. Mr. Devlin was active in the affairs of the Philadelphia Foundrymen's association, having been elected president in 1922 to fill the unexpired term of his father. He also served as a member of the executive committee which arranged the entertainment program for the annual convention and exhibition of the American Foundrymen's association which was held in Philadelphia in 1928.

Frederick M. Devlin

Guerden L. Brewster, 50, secretary, Chicago Hardware Foundry Co., North Chicago, Ill. and Elkhart, Ind., died in Waukegan, Ill., Sept. 6.

Robert S. Carroll, 36, former president, Carroll Foundry & Machine Works, Bucyrus, O., died in Bucyrus Sept. 1.

David G. P. Justice, until his retirement in 1924 manager of the Pittsburgh Valve Foundry & Construction Co., Pittsburgh, died at Crafton, Pa., Sept. 25.

Joseph N. Shenstone, former president, Massey-Harris Co., Toronto, Ont., manufacturer of farm implements, died at Toronto, Sept. 18. He was 79.

T. L. Ryerson, 59, president, W. D. Allen Mfg. Co., Chicago, died Sept. 19. He had been associated with the company for many years, succeeding the late W. D. Allen to the presidency.

J. W. Busch, 71, formerly foundry superintendent, Rensselaer Valve Co., Cohoes, N. Y., Pratt & Cady Co., Hartford, Conn., and the Chapman Valve Co., Indian Orchard, Mass., died at Hartford, Conn., Sept. 7.

Henry Lengfelder, president of the Orbon Stove Co., Belleville, Ill., died at his home in that city on Sept. 25. Mr. Lengfelder was active in business and civic affairs, and had been president of the Orbon Stove Co., one of the largest plants in the Belleville district, for a number of years.

Harry H. Elmer, 55, former general manager, Haynes Automobile Co., and of the Globe Malleable Iron & Steel Co., predecessor of the Globe Forge & Foundries Inc., died in Syracuse Sept. 13 following a heart attack. Mr. Elmer was born in Indianapolis and moved to Syracuse in 1912. He had been retired since 1927.

John Clifton Henderson for the past 25 years consulting engineer for the Driver-Harris Co., Harrison, N. J., died in the Elizabeth General hospital, Elizabeth, N. J., Sept. 25. Mr. Henderson was credited with the invention of cast Nichrome which is used in the form of carburizing containers by manufacturers of automobile and automotive equipment.

L. A. Vincent, sales manager, Swindell-Dressler Corp., Pittsburgh, died Sept. 7 at Gary, Ind., following a heart attack. Mr. Vincent was born in Pleasantville, Pa., in 1895 and was graduated from the University of Pittsburgh with a degree in chemical engineering. He entered the employment of the American Dressler Tunnel Kilns Inc., Cleveland, in 1920 in the capacity of thermal engineer and in 1928 became sales manager and vice president. After the consolidation of that company with William Swindell & Bros. to form the Swindell-Dressler Corp., he retained the position of sales manager.

A. S. Maxwell, 58, sales and advertising manager, J. H. Williams & Co., New York and Buffalo, died at his home in Garden City, Long Island, N. Y., Sept. 9. Mr. Maxwell entered the employ of that company, then located in Brooklyn, N.Y., in 1910, as assistant sales manager. He became sales manager in 1915. Previous to joining the Williams organization he was the Pittsburgh representative of Whitman & Barnes Mfg. Co., Akron, O., and then became connected with the Pittsburgh Gage & Supply Co., Pittsburgh. Later he established a manufacturers agency as Maxwell & Bassett.

Charles Piez, 67, formerly chairman of the board of the Link-Belt Co., Chicago, died Oct. 2 at the Garfield hospital, Washington. He was born in Germany of naturalized American parents and received his technical education as a mining engineer at the School of Mines, Columbia university, New York. Immediately after he was graduated in 1889 he entered the employ of the Link-Belt Engineering Co., Philadelphia, as engineer-draftsman. After he had attained the position of chief engineer and general manager of the Philadelphia works, in 1906 he was elected president of a consolidated organization of the three related companies, the Link-Belt Machinery Co., Chicago, the Ewart Mfg. Co., Indianapolis, and the Link-Belt Engineering Co., Philadelphia.

Charles Piez

Largely as a result of his fame as an organizer and manager of industry, Mr. Piez was selected by Edward N. Hurley, then chairman of the U. S. Shipping board, in November, 1917, to be vice-president and general manager of the Emergency Fleet Corp. to carry out the nation's shipbuilding program. As chief executive of that enterprise, and later succeeding Charles M. Schwab as director general, Mr. Piez advised upon and directed the expenditure of three billion dollars. He had control over 600,000 persons employed in the shipyards and fabricating plants and in industries furnishing supplies to the yards.

Mr. Piez resigned as director general on May 1, 1919 to return to his former business. He continued as president of the Link-Belt Co. until 1924 when he became chairman of the board and remained as chief executive until Feb. 1932. He was a past president of the American Society of Mechanical Engineers and served twice as president of the Illinois Manufacturers' association. He also was a member of the executive committee of the Museum of Science and Industry founded by Julius Rosenwald.

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DESIGNED AND BUILT TO SUIT THE JOB

Statement of the ownership, management, circulation, etc., required by the act of congress of Aug. 24, 1912, of THE FOUNDRY, published Monthly at Cleveland, O., for Oct. 1, 1933. State of Ohio, county of Cuyahoga, ss. Before me, a notary public in and for the state and county aforesaid, personally appeared I. D. Pease, who, having been duly sworn according to law, deposes and says that he is the Business Manager of THE FOUNDRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of Aug. 24, 1912, embodied in section 411, Postal laws and regulations, to wit: 1.—That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Penton Publishing Co., Cleveland, O. Editor, D. M. Avey, Cleveland, O. Managing Editor, F. G. Steinebach, Cleveland, O. Business Manager, J. D. Pease, Cleveland, Ohio. 2.—That the owners are: Names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock: Penton Publishing Co., Cleveland, O.; John A. Penton, Cleveland, O.; C. J. Stark, Cleveland, O.; J. D. Pease, Cleveland, O.; F. V. Cole, Cleveland, Ohio; J. R. Dawley, Cleveland, Ohio. 3.—That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4.—That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. J. D. Pease. Sworn to and subscribed before me this 29th day of Sept., 1933. (Seal) H. L. Richey. (My commission expires May 7, 1936).

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Manifolds
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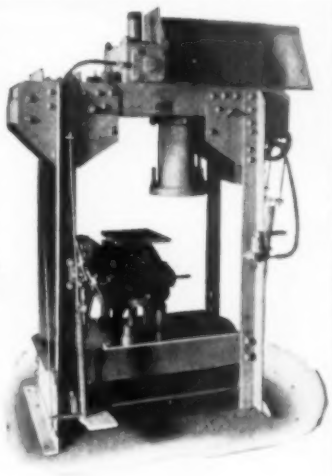

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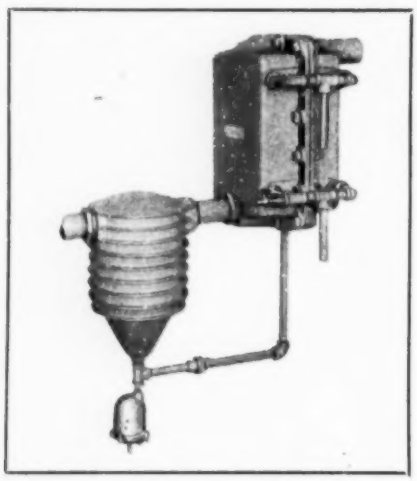
New Equipment

For Foundries

Drying System Has Cooler, Seperator and Trap

Ruemelin Mfg. Co., 1570 South First street, Milwaukee, recently has introduced a new compressed air drying system which combines an aftercooler, a moisture expeller and an automatic drain trap. The aftercooler is a compact unit which removes the heat from compressed air



Air is cooled and then sent through the moisture expeller

by the counter flow of the air and cooling water. The interior of the cooler is designed so that the air is spread out thin whereby it is claimed that the air temperature may be reduced to within 2 degrees of the cooling water used. Preferably the cooler is installed adjacent to the air receiver tank.

After the air has been cooled, it is passed through the moisture expeller, which has superior fins to provide an air cooled body, and the water and oil suspended in a free state in the compressed air is removed. The automatic trap then drains the accumulated oil and water from both the aftercooler and expeller and discharges it into a sewer connection. The needle valve and its seat are made from a rustless alloy metal and a drain plug permits draining the trap to prevent it from rusting.

To provide economical operation, the same water supply as is used for cooling the compressor jackets, is employed for the aftercooler. The cold water first is used in the aftercooler and then piped to the compressor jackets. A view of the system with its three parts is shown in the accompanying illustration.

Builds Roller Bearing Combination

Standard Conveyor Co., Minneapolis, has introduced a gravity roller with ends formed in one piece to receive the bearing. A recess is formed in the end of the roller to receive a stationary dust shield fastened on the inner ball race. The inner steel shield also is made a part of the bearing, fitting closely against the inner race to retain the grease. A hexagon axle prevents the inner race from turning and a correspondingly shaped hole is punched on the side rails making a positive lock at that point.

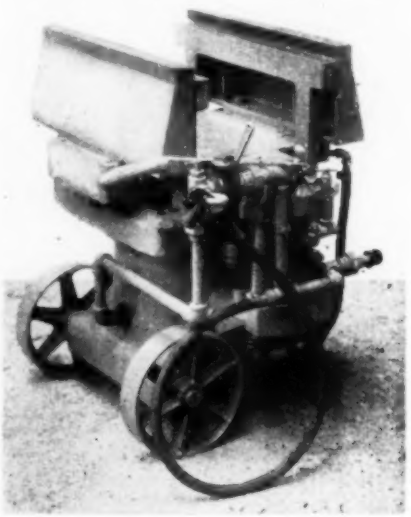
The combination is supplied packed with grease and for extremely wet or dusty conditions the end of the shaft is drilled for regreasing or flushing of the bearing. The outer end of the bearing cone is counterbored so the grease can go completely around the shaft and through the holes in the cone into the space allowed in the bearing and between the bearing and the shields.

Builds Small Pumps

Duriron Co., Inc., Dayton, O., recently has introduced a new pump for handling corrosive chemicals. The unit, which is the smallest built by that company, has a 1-inch suction, 1-inch discharge, and at 1750 revolutions per minute, the head and capacity range from 2½ gallons per minute at 25 foot head to 25 gallons per minute at 5 foot head, with the power consumption varying from approximately ¼ horsepower to less than ½ horsepower. The pump is applicable to small plating plants.

Control Pattern Draw on Jolt Machine

Tabor Mfg. Co., 6225 Tacony street, Philadelphia, has introduced a new machine for the rapid production of molds, which utilizes a jar to ram the sand uniformly and quickly, and provides a positive mechanical draw. The jar operation is controlled by a lever valve located



After the pattern is loosend from the sand, the draw speeds up

conveniently and the vibrator and draw by a single valve lever.

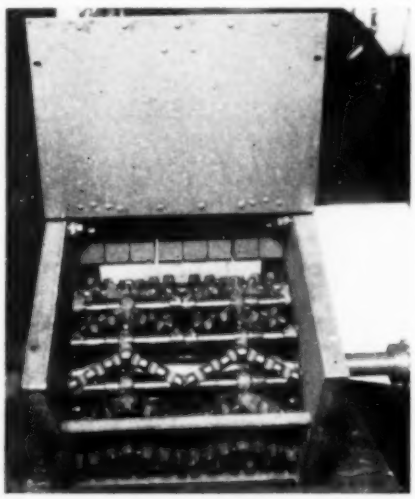
The pattern draw is by air admitted on oil. It is claimed that this places the draw under the complete control of the operator at all times and makes possible the slow start at the beginning of the drawing operation which is necessary for a clean draw.

The machine illustrated will accommodate pattern plates, 10, 12, 14 or 16 inches wide and up to 30 inches in length. Pattern draw is 4 inches and capacity 450 pounds. Flasks up to 24x36 inches can be handled by using lifting posts through the pattern plate to lift the flask. The overall height of the machine is 28½ inches.

Aerator May Be Attached to Mixer

National Engineering Co., 549 West Washington boulevard, Chicago, recently has developed an aerator unit for attaching to the discharge end of the intensive type sand mixer manufactured by that company. An interior view of the aerator, showing the rotating drum with angular toothed combing bars, is shown in the accompanying illustration.

The drive for the aerator on the



Interior of the sand aerator showing rotating drum and angular toothed combing bars

No. 2 type mixer made by the National company is arranged from the horizontal shaft of the mixer by sprockets and chain. On the No. 1 and 3 mixers, a texrope drive with separate motor is used. The angular combing bars of the rotating drum are reversible and it is pointed out that replacement bars may be cast in any iron foundry.

The aerators also are supplied for use in continuous sand handling and sand preparing systems.

Arranges Abrasive Grains on Sandpaper

A new sandpaper which it is claimed will speed up work and decrease effort because of the sharper surface, recently has been developed through the application of an electrocoating process. The coated abrasives are being introduced by the Armour Sandpaper Works, Chicago, the Behr-Manning Corp., Troy, N. Y., the Carborundum Co., Niagara Falls, N. Y., and the Minnesota Mining & Mfg. Co., St. Paul, Minn.

The electric method employed in manufacture is responsible for the high qualities claimed for the electrocoated abrasive. By a 100,000-volt electrostatic force, abrasive grains are arranged in equal spacing over the surface of the backing, with the sharpest cutting points facing outward. Simultaneously, these particles are set firmly in glue.

Tests made by the manufacturers lead to claims that electrocoating increases the efficiency of sandpaper for production and maintenance work on the average of from 30 to 40 per cent. Various abrasive materials will be used in this new line with grit numbers from fine to coarse. Shapes and backing materials are being used to suit the wide variety of requirements.

Changes Design Of Cutting Attachments

Linde Air Products Co., 30 East 42nd street, New York, has changed the design of its cutting attachment whereby the heating oxygen throttle also can be used as an oxygen shut-off valve for temporary stops in cutting. The throttle has been redesigned and the valve packing improved to make the valve operate more easily. The cutting attachment was developed to provide a general blowpipe suitable for all kinds of work. The cutting attachment is sufficiently small, compact and light to be carried around in the operator's pocket so that it will be available when needed.

Agitator Is Built In Several Frame Types

An agitator which is built in both vertical and horizontal types has been developed by the Patterson Foundry & Machine Co., East Liverpool, O. When using motors running at 1800 revolutions per minute, the agitator will produce shaft speed down to less than 1 revolution per minute if desired, without the use of gears.

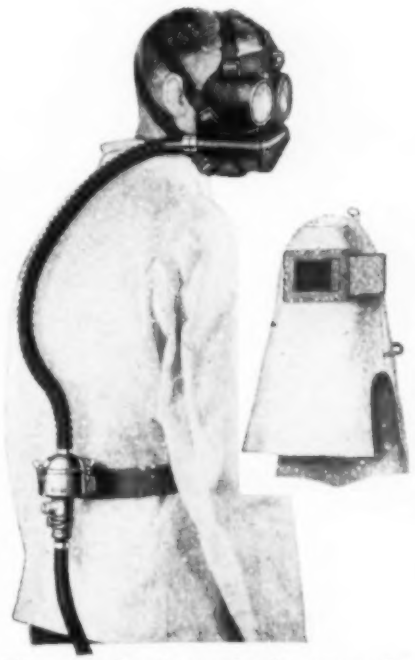
The agitators are built in sizes of 40 horsepower down to fractional sizes in several types of frames, and are designed to require no additional bearings or flexible couplings for installation.

Film Strength of Oil

A new series of industrial lubricants made of pure mineral oil which is polymerized under controlled heat and pressure, has been introduced by E. F. Houghton & Co., Philadelphia. It is claimed that the treatment results in a rearrangement of molecules of the oil without any change in its chemical content, and thus gives a closer bond between all of the molecules and an increased film strength in this form of lubricant.

Sandblast Mask Fits Facial Contour

A new sandblast mask has been introduced by the Chicago Eye Shield Co., 2300 Warren boulevard, Chicago. The mask consists of a soft molded rubber face piece designed to adapt itself to any facial contour, and held in position by a molded rubber headharness fitted with detachable and adjustable buckles. A molded flexible rubber tube is attached to the side of the facepiece permitting free



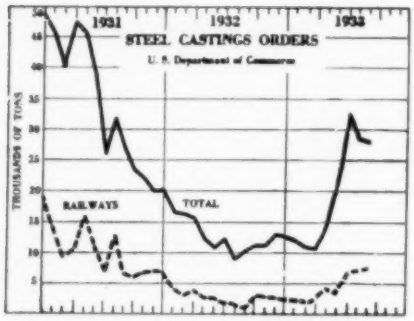
The outer hood completely covers the facepiece when in use

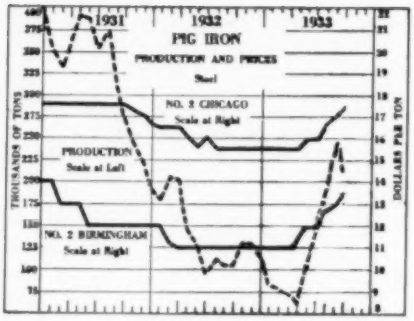
movement of the head. The lower end of the tube connects with the air filter which in turn is attached to an adjustable belt. Air pressure is regulated by an adjustable control valve.

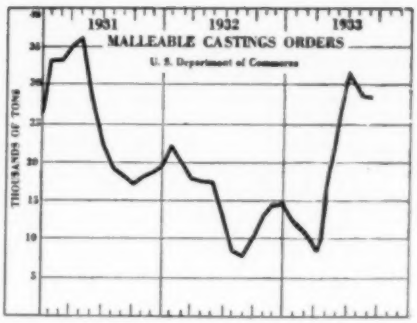
Exhaled air is released through a channel by a positive exhaust valve permitting only an outward movement. This prevents the wearer from inhaling any air other than that delivered through the intake channel. When in operation the facepiece is covered completely by an outer hood which is part of the standard equipment. Lenses and a perforated metal screen in the hood are replaceable.

Breakers Protect Industrial Circuits

A line of small circuit breakers, rated up to 600 volts and 600 amperes and designed for the control and protection of industrial circuits, etc. has been developed by the General Electric Co., Schenectady, N. Y. The new breakers employ a principle of arc interruption, in which the break takes place within a closed metal chamber.







Foundry Activities

Reflect Industrial Trends

LIBERTY RANGE WORKS, Nashville, Tenn., recently purchased the plant of the Allen Mfg. Co., Franklin, Tenn., transferred its operations from Nashville to Franklin and changed its name to the Dortch Stove Works. The Dortch company now is operating at full capacity employing about 300 men. O. L. Dortch is president, W. I. Moody, vice president, Edward S. Criddle, vice president, G. O. Stanley, secretary and T. F. Lance, treasurer.

The Allen Mfg. Co., also a manufacturer of stoves, has moved back to Nashville in the plant which was abandoned in 1930 when it built the new plant in Franklin.

* * *

Eaton Erb Foundry Co., Vassar, Mich., is building two additions, one an air compressor building and the other a cooling department.

* * *

Dwyer Products Co., Michigan City, Ind., has been incorporated to operate a foundry by Lawrence P. Dwyer, Horace A. Soper and George Sass.

* * *

Barium Steel Corp. recently organized has purchased the plant formerly occupied by the Canton Steel Foundries Co., 15th street and Allen avenue, Canton, O.

* * *

Union Brass Foundry Inc., Newark, N. J., has been incorporated to manufacture brass products by Charles A. Woodruff, 31 Clinton street, Newark.

* * *

Lynch Corp., Anderson, Ind., has purchased the patents and assets of Edward Miller and the Miller Machine & Mold Works, Columbus, O., including the factory at 705-719 Ann street. The Lynch Corp. will continue to operate the Columbus factory as the Miller Machine & Mold Works division and will specialize in the manufacture of glass house machinery and molds. Andrew G. Doll, associated with the Miller works for 14 years, will be in charge of the Columbus factory.

* * *

American Brake Shoe & Foundry Co., 74 New Montgomery street, San Francisco, plans erection of a mill-type foundry building on Tanforan avenue. K. Theill, 580 Market street, is engineer.

* * *

Titus Iron Foundry Co., Coldwater, Mich., reports that it has arranged with customers for advances in prices which will enable them to meet the demands of their employes for higher wages.

* * *

Bondholders of the Brillion Iron Works, Brillion, Wis., have acquired its assets at receiver's sale and plan to form a new corporation to resume operations in production of a soil pulverizer, and to do a general jobbing foundry business.

* * *

Sam S. Hoffman recently was re-elected president of the Moline Foundry & Machine Co., Moline, Ill. Other officers are as follows: Vice president and general manager, Gustave C. Nelson; secretary, C. V. Johnson; directors, Helen A. Hoffman, Gustave Nelson, C. V. Johnson and Edward A. Evans.

* * *

Bethlehem Steel Co. has been awarded 51,800 tons of cast iron segments and special castings for the Midtown Hudson river tunnel, Manhattan-Weehawken, N. J., to be built by the Port of New York authority. The contract requires 48,500 tons of cast iron segments and 3300 tons of cast steel segments.

* * *

Canadian Steel Foundries Ltd., Longue Pointe Works, Montreal, Que., has received an order for six additional sets of turbine castings. The company is reported to have twice as much unfilled tonnage of steel castings on its books at the present time as was turned out in the entire Dominion of Canada during September a year ago.

* * *

Production of gray iron castings increased 5 per cent in August over July in the Philadelphia Federal Reserve district, according to a recent report of the industrial research department, University of Pennsyl-

RAW MATERIAL PRICES
Oct. 4, 1933

Iron	
No. 2 foundry, Valley	$17.50
No. 2 Southern, Birmingham	13.50
No. 2 foundry, Chicago	17.50
No. 2 foundry, Buffalo	17.50
Basic, Buffalo	16.50
Basic, Valley	17.00
Malleable, Chicago	17.50
Malleable, Buffalo	18.00
Coke	
Connellsville beehive coke premium	$4.50
Wise county beehive coke	3.00 to 4.25
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$12.50 to 13.00
Heavy melting steel, Pitts	12.50 to 13.00
Heavy melting steel, Chicago	9.50 to 9.75
Stove plate, Buffalo	9.00 to 9.50
Stove plate, Chicago	7.00 to 7.50
No. 1 cast, New York	8.00
No. 1 cast, Chicago	9.50 to 10.00
No. 1 cast, Pittsburgh	11.50 to 12.00
No. 1 cast, Philadelphia	12.00
No. 1 cast, Birmingham	10.00 to 10.50
Car wheels, iron, Pittsburgh	11.50 to 12.00
Car wheels, iron, Chicago	9.50 to 10.00
Railroad malleable, Chicago	10.00 to 10.50
Malleable, Buffalo	11.00 to 12.00
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	8.75
Straits tin	48.75
Aluminum, No. 12, producers	19.00 to 22.00
Aluminum, No. 12 remelt Cleveland	12.50 to 13.25
Lead, New York	4.50
Antimony, New York	6.87½ to 7.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.75

vania. Malleable iron foundries experienced a decrease of 13 per cent from the peak in July and steel foundry operations showed a decrease of 12 per cent.

* * *

Michigan Valve & Foundry Co., 3631 Parkinson avenue, Detroit, has changed its name to Parkinson Valve & Foundry Co.

* * *

J. M. Pittman and H. D. Brown have established a foundry on West Sixth street, Little Rock, Ark., to manufacture gray iron, brass, aluminum and bronze castings.

* * *

West Side Foundry Co., 8955 Thaddeus street, Detroit, has been incorporated with $1000 capital to operate a foundry and machine shop, by Mike Syzdek, 4646 St. Aubin avenue, Detroit.

* * *

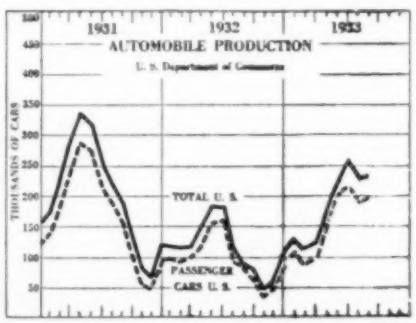
Central Pattern & Foundry Co., 3737 South Sacramento avenue, Chicago, is doubling its capacity by erecting a foundry building 100 x 200 feet for the production of aluminum and bronze castings. The present plant of the company is now engaged on 24-hour schedule.

* * *

The Ohio Brass Co., Mansfield O., has secured the contract for porcelain insulators to be used in a 270-mile power line from Boulder Dam, Nev., to Los Angeles. The contract involves $450,000 and is for delivery in 1934. Shipments will start shortly after Jan. 1. The order involves 325 tons of malleable iron which will be made at the company's Mansfield plant.

* * *

An item in the September issue to the effect that the A. B. Stove Co., Battle Creek, Mich., had discontinued its foundry and was securing its castings from the Marshall Furnace Co., Marshall, Mich., a subsidiary company, was partly in error, as there is no connection between the two companies. The A. B. Stove Co. does not own stock in the Marshall Furnace Co. and the Marshall Furnace Co. does not own stock in the A. B. Stove Co. THE FOUNDRY regrets this error.



New Trade Publications

MAGNETIC EQUIPMENT.—Magnetic Mfg. Co., Milwaukee, recently has published a bulletin "The House of Magnetic Magic," which discusses the important work carried by the company's laboratory in dealing with problems of magnetic separation

Faked Foundry Facts

Dabber

It is pointed out that the field of application of magnetic separation equipment has been extended from industries such as flour milling, mining, founding, that have long used magnetic equipment for protection of machinery and reclamation of materials, to process manufacturers such as ceramics, paper, rubber and food industries, where the equipment is needed to assure purity of product as well as for protection of valuable equipment.

GLUE POTS.—A bulletin recently published by the General Electric Co., 1966 Woodland avenue, Cleveland, describes electrically heated glue and compound melting pots. The units described include a jacketless glue pot, a three-heat water jacket glue pot, and a three-heat compound melting pot.

OPTICAL INSTRUMENTS.—Bausch & Lomb Optical Co. Inc., Rochester, N. Y., has published a booklet "Optical Instruments for the Metal Working Industries," which presents illustrated articles on the various pieces of equipment and discusses the methods of application.

CHAPLETS.—Combined Supply & Equipment Co. Inc., 766-772 Grant street, Buffalo, has published a bulletin giving sizes and prices on its new line of chaplets, which is sold under the name of Fusetite. The chaplets are made with either single or double heads, square or round heads, and plain or tinned.

REFRACTORY GUN—A one-man operated gun for applying refractory materials or similar products by compressed air is described in a bulletin recently issued by the Gunitor Co., 1227 West Beardsley avenue, Elkhart, Ind. It is pointed out that the equipment may be used in foundries for refractory repairs to cupolas, ovens, stacks, ladles, etc. and for sandblasting large castings.

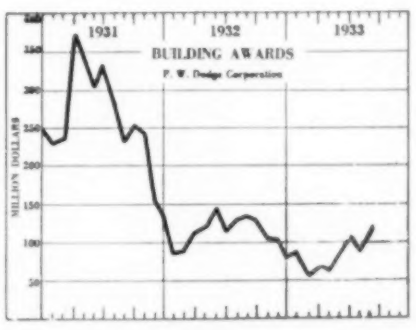
VALVES.—Jenkins Bros., 80 White street, New York, recently has published a 263-page catalog giving complete information on its line of valves and mechanical rubber goods. The book contains essential information about types, patterns, sizes, list prices, weights and dimensions of bronze, iron and steel valves. A section also is devoted to various engineering data listed in a handy and easily accessible form.

SOUND CASTINGS.—Alpha-Lux Co. Inc., 192 Front street, New York, has published a folder describing Liquitol, a fine dry powder which is used to retard the cooling of hot-top metal. The material is applied by sprinkling over the surface of the molten metal in heads and runners. The folder presents features which may be secured with the material, gives instructions for using the A type material on alloy steel and also the B type material on cast iron.

ROLL GRINDING—Carborundum Co., Niagara Falls, N. Y. recently has published a 45-page booklet containing a treatise on roll grinding. The text discusses various types of finishes and the methods by which they are secured, types and characteristics of rolls, coolants and filters, wheel stresses and their effect on wheel selection, causes of scratches on work, and various types of roll grinding machines and rolls which are ground.

ELECTRIC HEATING.—A symposium on "Electric Heating in Controlled Atmospheres," recently has been published by the Cleveland Electric Illuminating Co., Cleveland. Authors of articles include R. F. Benzinger, Electric Furnace Co.; F. A. Snyder, American Steel & Wire Co.; Edmund F. Burke, C. I. Hayes Inc.; Wirt S. Scott, Westinghouse Electric & Mfg. Co.; G. J. Hales, General Electric Co.; J. S. Ayling, Hevi Duty Electric Co.; and W. S. Evans, Globar Corp.

ODOR FILTER.—Consolidated Air Conditioning Co., 942 Chrysler building, New York, has prepared a bulletin describing its equipment for extracting practically all odor-creating organic and inorganic gases and vapors from the air. The unit is designed especially for ventilating and air conditioning systems, industrial systems where odors are removed from the air to prevent contamination of products, and for special systems such as hospitals and operating rooms.



Classified Ads

Help Wanted

WANTED

Experienced foundryman take charge of coreroom in modern production jobbing and auto foundry located in Cleveland. Reply Box 797, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT

For large bronze foundry handling all kinds of nonferrous alloys; heavy (dry sand) and light floor work, also machine and bench molding. Apply giving qualifications, experience, age and salary expected. Address Box 789, THE FOUNDRY, Cleveland.

Employment Service

SALARIED POSITIONS.
$2,500 to $25,000

This thoroughly organized advertising service of 23 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details.

R. W. BIXBY, INC.
101 Delward Bldg., Buffalo, N. Y.

ATTENTION FOUNDRY OWNERS

Write or wire us for technically-trained practical foundry foremen, superintendent, production managers, chemists, metallurgists, core foremen, cost clerks, salesmen, patternmakers, melters (electric, open-hearth, converter and cupola.) No charge. Licensed Agency, McLAIN'S SYSTEM, INC., 804 Goldsmith Bldg., Milwaukee, Wis.

Positions Wanted

GRAY IRON FOUNDRY SUPERINTENDENT
One of the Mid-West's outstanding foundrymen with unusual ability to effect production economies. Technical knowledge and mechanical skill combined with natural executive ability; aggressive, good organizer. Age 43. Thoroughly competent to handle entire operations, estimating, production, and metallurgical. 16 years successful record as foundry executive with two large companies. Address Box 786, THE FOUNDRY, Cleveland.

FOUNDRYMAN

Age 39. 21 years experience. Desires connection. Started at bottom as molder. Has been inspector, foreman, superintendent, both jobbing and production shops in steel and iron. Address Box 741, THE FOUNDRY, Cleveland.

ELECTRIC FURNACE METALLURGIST

16 years active experience, acid or basic, carbon, alloys and irons. Specialist on castings. Want a living wage only with future. Perfect references. Address Box 747, THE FOUNDRY, Cleveland.

GRAY IRON SUPT. OR MANAGER

Thoroughly experienced in all branches of foundry practice. Twenty-five years experience in responsible executive positions. Excellent references. Address Box 684, THE FOUNDRY, Cleveland.

PATTERN FOREMAN

With wide experience in all classes of work, 8 years in present position as wood foreman in jobbing shop employing up to 45 wood and 125 metal men, automotive and general patterns. Wishes position with corporation. Address Box 750, THE FOUNDRY, Cleveland.

PRACTICAL GRAY IRON MAN

Technically trained, age 30. 10 years experience jobbing and production shops as foreman and assistant superintendent, desires position with future. East preferred. Address Box 339, THE FOUNDRY, Cleveland.

Positions Wanted

MANAGER OR SUPERINTENDENT

Malleable or gray iron. Twenty-five years experience. Past ten years general manager large corporation, malleable division. Can handle entire operations, sales, and factory. Well acquainted with automobile trade. Age forty-five. Very highest references. Address Box 744 THE FOUNDRY, Cleveland.

GRAY IRON FOREMAN

or superintendent on work from 1 lb. to 50 tons. **Specialized heavy machine castings. Mix by** analysis. Many years experience as molder foreman **and superintendent. Address Box 567, THE FOUNDRY, Cleveland.**

SUPERINTENDENT OR FOREMAN

Twelve years experience, seeking connection with a steel foundry in need of a first class foundryman. Heavy or light, production or jobbing work. Practical molder. Technical graduate. Age. 43. Salary open. Go anywhere. A1 references. Address Box 749, THE FOUNDRY, Cleveland.

GRAY IRON FOREMAN

On light medium jobbing stove furnace production. Know pattern rigging for machines from squeezer to sandslinger. Save money on cupola, cleaning, coreroom cost. Reference. Address Box 768, THE FOUNDRY, Cleveland.

FOUNDRY EXECUTIVE

with 15 years experience in sales, metallurgy, chemistry and heat-treating on jobbing and automobile castings in gray iron, semi-steel, steel and malleable. Supervised electric furnaces. Technical education. Former Government engineer. Address Box 792, THE FOUNDRY, Cleveland.

FOREMAN—SUPERINTENDENT

Gray iron, malleable, McLain graduate. Twenty years experience, eight as foreman. Stove, furnace, locks, light jobbing, expert on gas burners. Age 40. Address Box 571, THE FOUNDRY, Cleveland.

FOUNDRY FOREMAN

Thoroughly experienced on stove plate, round and sectional boilers and light jobbing work. McLain graduate. Good organizer with successful record as foreman. Address Box 755, THE FOUNDRY, Cleveland.

EMPLOYERS PLEASE NOTE!

When you are in need of a reliable man for immediate or future need, scan the position wanted ads in this section and reply to them. These advertisers will welcome the opportunity to set forth their qualifications.

If the man you want isn't listed here, a Help Wanted ad will bring quick results.

CLASSIFIED RATES

Position Wanted advertisements; minimum ad 30 words, $1.50, additional words 5c each.

Help Wanted advertisements; minimum ad, 50 words $3.00; additional words 6c each.

For Sale, Wanted and Miscellaneous advertisements 10c per word, minimum advertisement $3.00.

Reduced rates for three or more insertions.

First line is set in bold face type. A box address counts as six words.

Positions Wanted

COREROOM FOREMAN, SALESMAN, DEMonstrator desires position. 25 years practical experience including production and jobbing, gray iron, malleable steel or brass. Available at once at reasonable salary. Address Box 794, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT

Technically trained in gray iron, bronze, jobbing and production; cupola, crucible, and air-furnace. 18 years on highest grade large and small machinery castings; high test and acid resisting metals. Invite correspondence. Address Box 758, THE FOUNDRY, Cleveland.

GRAY IRON AND MALLEABLE, METALLURgist, Chemist and Superintendent. Experience in all types of metal from cupola, electric and air furnaces. Age 41. Address Box 791, THE FOUNDRY, Cleveland.

PRACTICAL MOLDER AND SUPERINTENDent. Complete responsibility. Good record in sales, handling men. Cupola, equipment, light or heavy castings. Production or jobbing work. Address Box 795, THE FOUNDRY, Cleveland.

BRASS FOUNDRY FOREMAN DESIRES POSItion. 20 years practical experience on chandelier castings, architectural, ornamental brass, bronze, aluminum and nickel silver, jobbing and production. Willing to start as a working foreman. Address Box 793, THE FOUNDRY, Cleveland.

GRAY IRON SUPERINTENDENT

Large foundry preferred. Heavy or light castings. Specialized on high grade difficult castings. Up-to-date on equipment. Best of references. Will go any place. Address Box 386, THE FOUNDRY, Cleveland.

STEEL FOUNDRYMAN

Superintendent or Engineer. College graduate with ten years practical experience. Three years as superintendent. Excellent references. Electric and open hearth. Large and small, plain or alloy castings. Experienced in pattern design, estimating, production work and jobbing. Age 35. Address Box 783, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT OR FOREMAN
looking for new connections. 18 years executive. Experience on gray iron and nonferrous light or heavy work. At present employed. Go anywhere. Address Box 784, THE FOUNDRY, Cleveland.

PRACTICAL STEEL FOUNDRY FOREMAN
experienced on all classes of work, heavy, light, green and dry sand. Electric and open hearth, machine or floor. Best of references. Go anywhere. Address Box 785, THE FOUNDRY, Cleveland.

SUPERINTENDENT OR GENERAL FOREMAN
of nonferrous foundry. Thoroughly practical in all branches, melting, molding, coremaking, jobbing and production work. Castings light and heavy, especially pressure and marine castings. Valves, plumbing goods, etc. Good executive. Highest references furnished. Address Box 739, THE FOUNDRY, Cleveland.

PRODUCTION MANAGER

Foundry cost estimator, or general foundry executive with 17 years experience with malleable practice. Age 45. Salary open. Address Box 782, THE FOUNDRY, Cleveland.

MECHANIC AND MAINTENANCE MAN

Practical and Technical training. Several years erection and maintenance superintendent on sand blast equipment. Understands servicing of all foundry equipment. Available at once. Address Box 780, THE FOUNDRY, Cleveland.